morpho

anatomy for artists

Michel Lauricella

rockynook

morpho
anatomy for artists

Michel Lauricella

rockynook

Morpho: Anatomy for Artists
Michel Lauricella

Editor: Joan Dixon
Project manager: Lisa Brazieal
Marketing coordinator: Mercedes Murray
Translator: Marie Deer
Graphic design and layout: Sophie Charbonnel
Layout production: Michael Tanamachi

ISBN: 978-1-68198-374-5
1st Edition (1st printing, June 2018)

Rocky Nook Inc.
1010 B Street, Suite 350
San Rafael, CA 94901
USA
www.rockynook.com

Original French title: Morpho
French ISBN: 978-2-212-13914-3

Distributed in the U.S. by Ingram Publisher Services
Distributed in the UK and Europe by Publishers Group UK

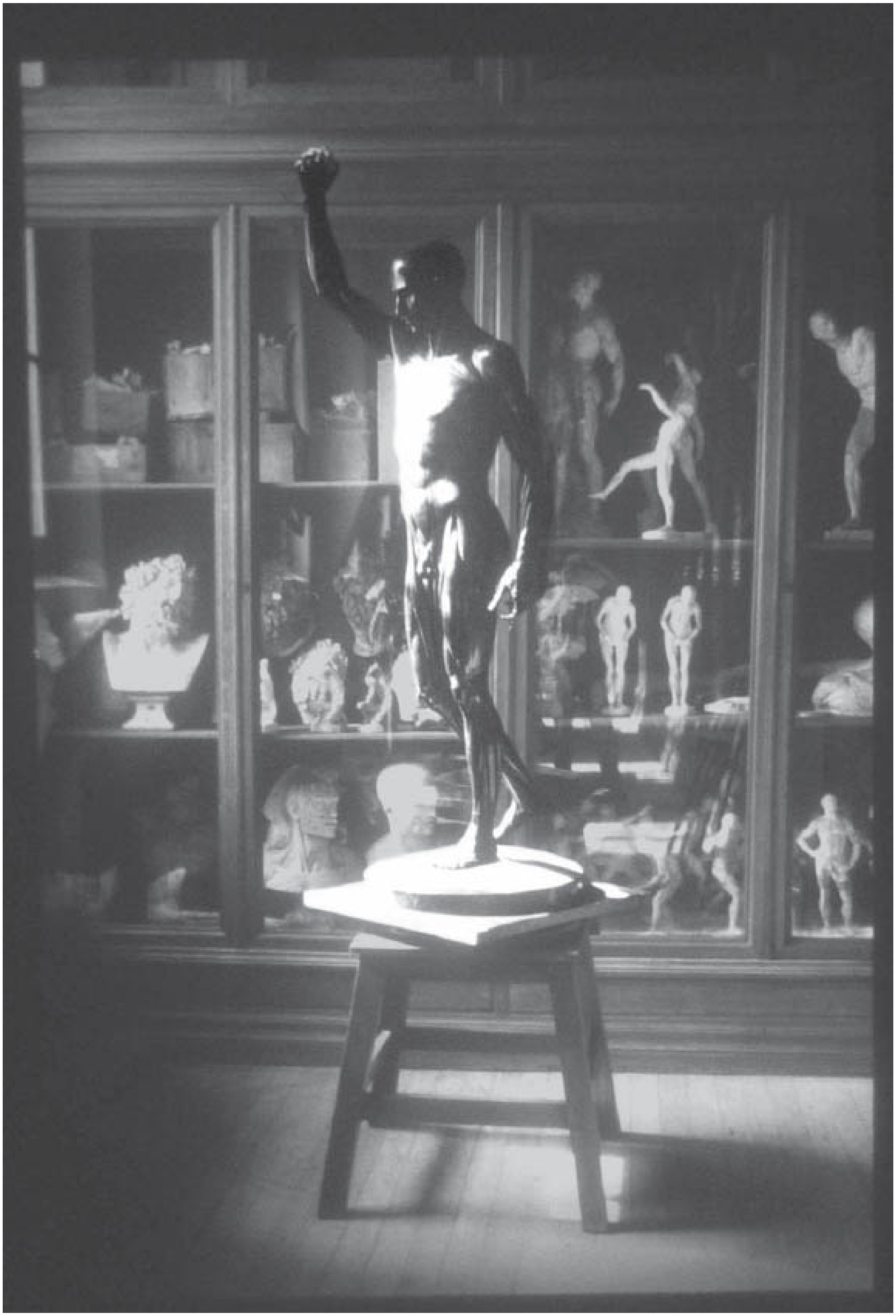
Library of Congress Control Number: 2017958973

All illustrations are by the author, with the exception of those on pages 7, 8, and 10.

This book is printed on acid-free paper.
Printed in China

table of contents

acknowledgements



Jean-Antoine Houdon, *Écorché*, 1792, Galerie Huguier, École nationale supérieure des beaux-arts de Paris

This book was produced at Fabrica114, a studio dedicated to the study of morphology in the tradition of the National School of Fine Arts in Paris (École nationale supérieure des beaux-arts de Paris). This tradition has been passed down by François Fontaine, Jean-François Debord, and Philippe Comar who is currently the head of the morphology department at this school. These three individuals have exposed a generation of students (myself included) to their vision of the human body. They gave us the opportunity to find our paths between a technical and mechanical approach and a more expressive and artistic approach to this art form. I give them my sincere thanks.

I also want to mention another professor at the School of Fine Arts, Dr. Paul Richer (1849–1933), whose book *New Artistic Anatomy*, (published in three volumes from 1906 to 1921) continues to serve as a highly-respected reference to this day. His works—both books and sculptures—have occupied a central position in the school's collections, and we students were fortunate to have been given unrestricted access to his works. Dr. Richer is quoted several times throughout this book.

Finally, I would like to pay tribute to the magnificent bronze écorché (a painting or sculpture of a human figure with the skin removed to display the musculature—the literal translation of the French word "écorché" is "flayed") by Jean-Antoine Houdon (1741–1828). This fantastic sculpture has inspired more than one vocation.

—Michel Lauricella

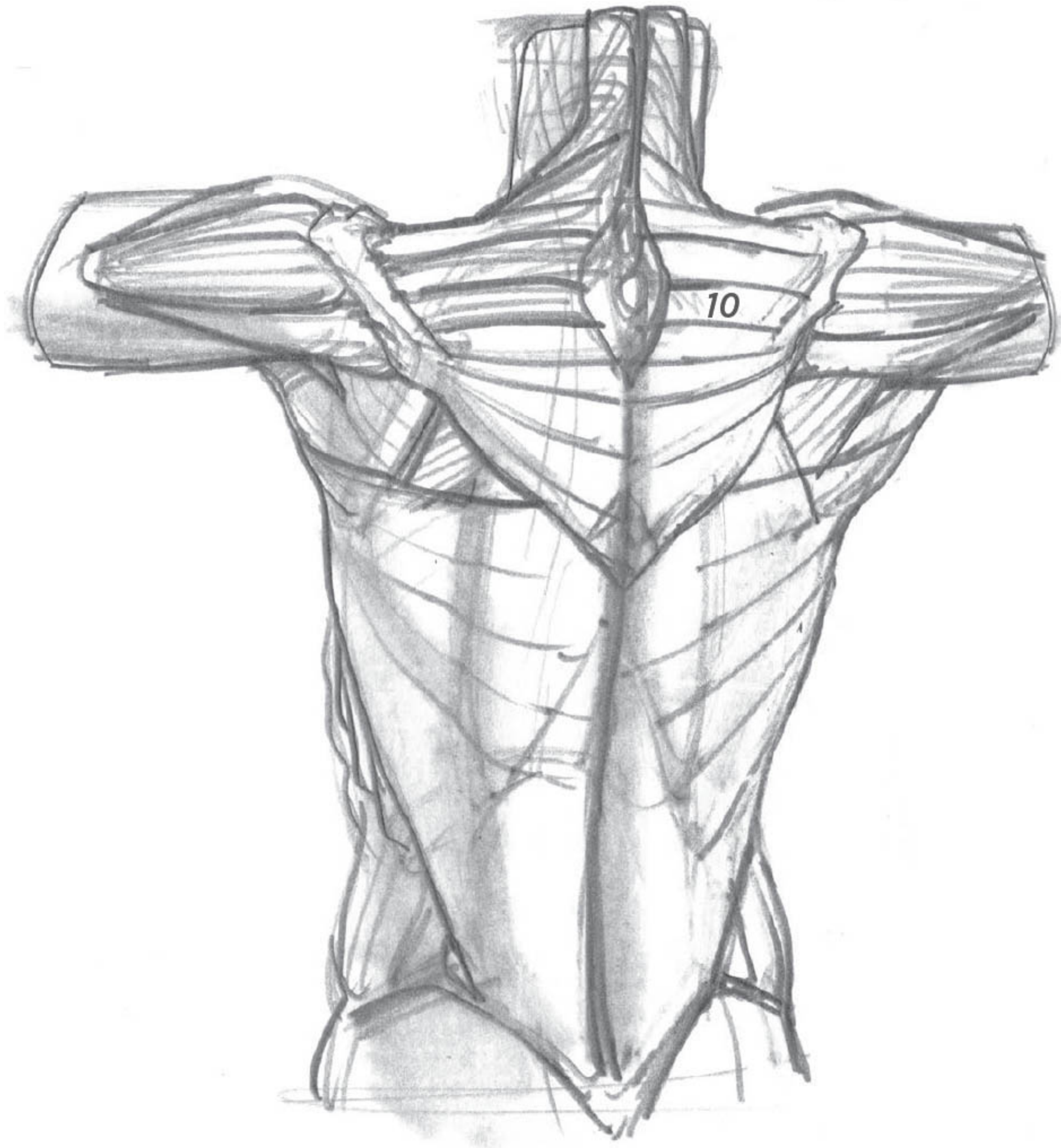
foreword

Morphology is learned from the drawing of live models, the foundations of which are composition (the management of formats, framing, full and empty spaces, etc.); proportions (the ratios of the various parts to each other and, in particular, of details to the whole); and balance (the alignment of various points of reference along a vertical axis, for instance the head with respect to the feet in a standing pose).

Anatomical representations can, at first, present two disadvantages: that of making us see shapes through their details at the expense of a global vision, and that of encouraging us to draw only those forms we recognize. Therefore, I recommend that you pursue a practice of sketching quickly, and that you do not lose sight of the fact that this way of knowing forms is relative, while the mystery of the body remains whole.

The foundations of drawing, as well as of morphology, should always be put into the service of a drawing in which you also invest your own personal experiences, your vision of the world, and your sensibility.

This volume is divided into six parts focusing on the head and neck, the torso, the roots of the arm, the upper limb, the lower limb, and an overview. Of course, the human body is not cut up into distinct regions, neither in terms of its shapes nor of its mechanics. For example, the trapezius (see 10 on the back cover flap) is a muscle that extends from the skull to the middle of the back and from there to the top of the shoulders. It is, therefore, largely related to the movements of the arms. While it is located in the regions of the neck, shoulders, and back, mechanically, it can be considered an arm muscle.



The letters and numbers on the drawings refer to the two tables found inside the cover flaps. As you turn the pages, you can leave the flaps open, allowing for easy reference to the tables. The bones are rendered on the drawings as abbreviations, with the corresponding table on the front flap. The muscles are rendered on the drawings as numbers, with

the corresponding table on the back flap.

My goal with this book is to present the body from as many angles as possible in order to provide a large-scale vision. Multiple versions of sketches and écorché figures at various levels of detail will expand the possibilities of representation available to you.

It is my hope that this book will familiarize you with the shapes of the human body, thus freeing you to concentrate on an unconstrained and personal interpretation in your own drawing. The distinctions made among the various points of reference (hard, soft, contracted, tense, relaxed) should make it possible to refine your drawing and make it more nuanced, more sensitive. Memorizing the shapes will certainly facilitate your imaginative drawing, allowing you to construct your characters in space and movement, and it will, at the very least, enrich your knowledge of your own body.

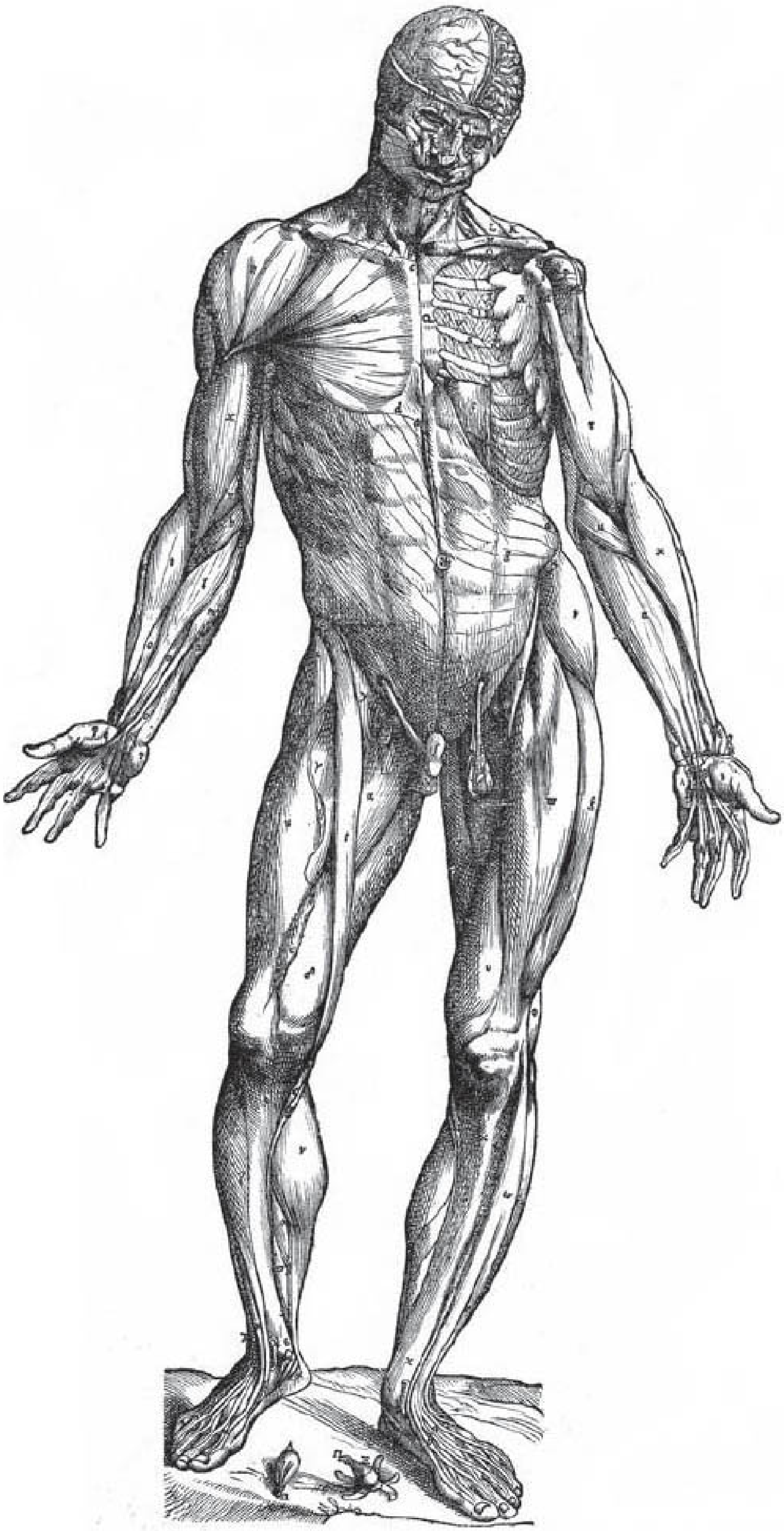
The aim of this book is to facilitate your learning. I am aware of the complexity of this discipline; therefore, I understand that this book cannot be considered a substitute for drawing live models in a studio with the help of a teacher.

The approach to body shapes taught in this book has encouraged me to reconsider all the shapes in nature, and it continues to provoke my curiosity and my wonder.

introduction

These skeletons or écorchés stupefy because they act like living creatures.

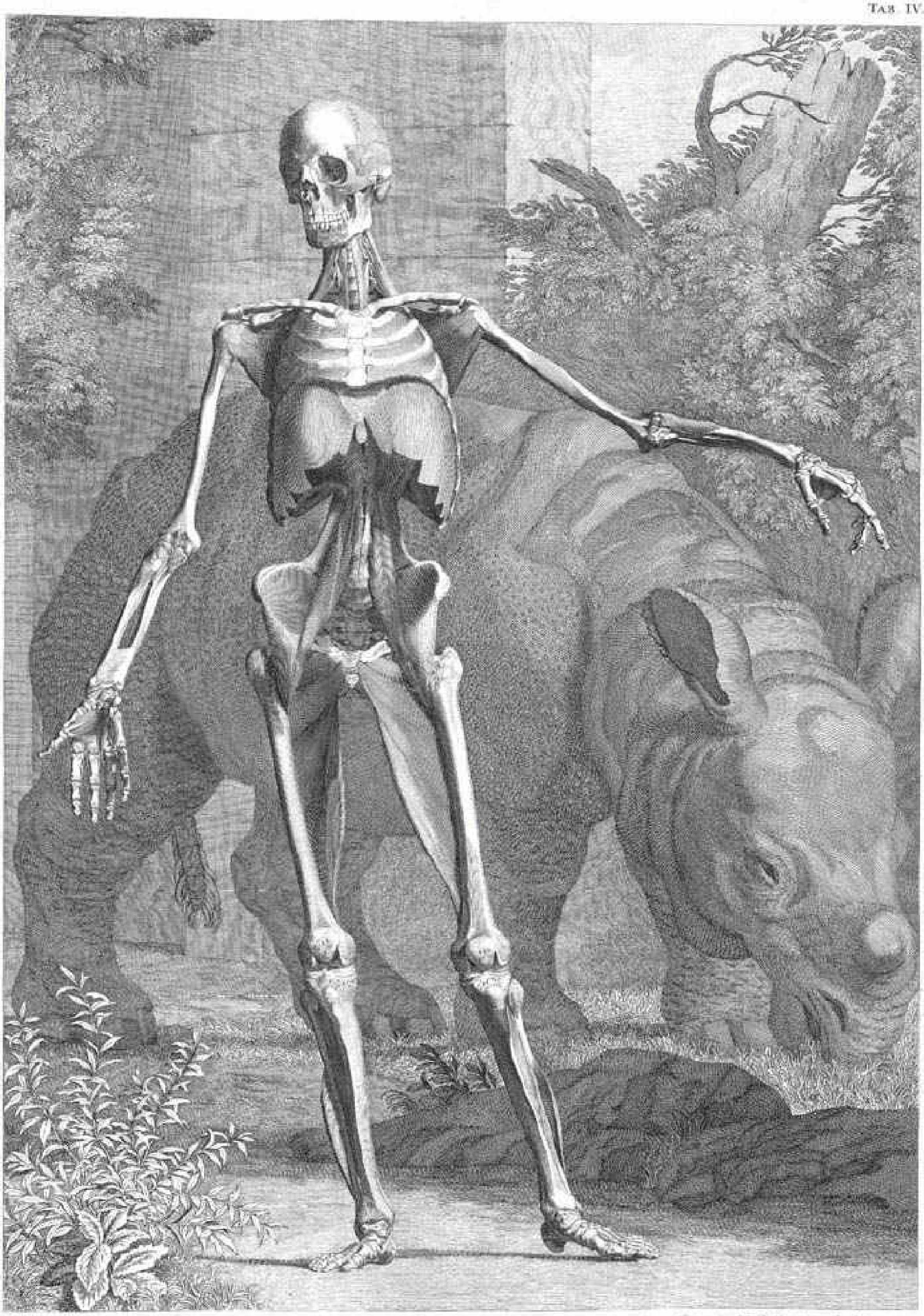
—Roger Caillois, Au coeur du fantastique (At the Heart of the Fantastic), Gallimard, Paris, 1965.



André Vésale (1514–1564) and Jan Steven Van Calcar (1499–1546), *L'Epitome (The Epitome)*, 1543.

The Écorché: a Genre

During the Renaissance, artists began producing works depicting the anatomy of the human body. These works were intended for art lovers, as well as for use by physicians. Given that Leonardo da Vinci (1452–1519) never finished his treatise, the 16th century seven-volume set of illustrated books, *La Fabrica*, by André Vésale is considered as marking the beginning of a long tradition of anatomical drawing that endures to this day.



C. Grignion Sculp.

Impensis J. & P. Knapton Londini. 1747.

Bernhard Siegfried Albinus (1697–1770) and Jan Wandelaar (1690–1759), *Tabulae Sceleti et Musculoru Corporis Humani* (1747).

Throughout history, the care that has been given to the representation of écorché figures, originally intended as simple anatomical studies, has made them into a subject in themselves—a genre just like the nude or the landscape. This genre also has its own history, codes, and conventions, and can be used as a means of personal expression. These écorché characters captivate us, with their bodies stripped and laid bare, improbably suspended between life and death. The surrealists later appreciated their strongly fantastical aspect.

Jacques Fabien Gautier d'Agoty (1716–1785), *Complete Myology, in*

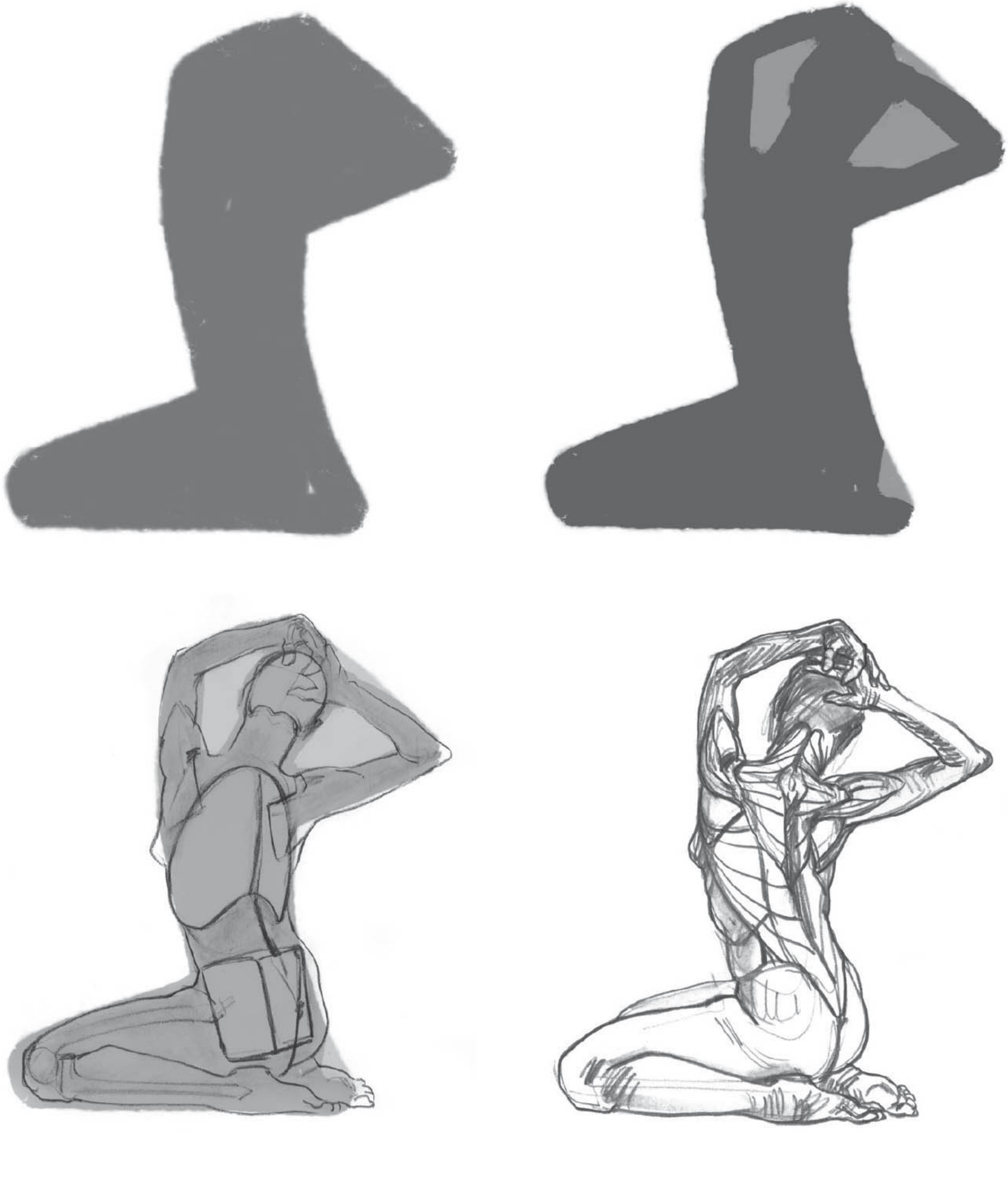
Natural Color and Size (1746) (renamed *Anatomical Angel* by the surrealists).

Morphology

As early as 1890, Paul Richer preferred using the term "morphology" to "anatomy," as he believed the term "morphology" was more about aesthetics and the form as a whole rather than about medicine and its individual details. We shorten it "morpho."

This morpho approach involves retaining only those elements of anatomy that determine shape (we simplify and merge certain groups of muscles as necessary), making whichever anatomical element is most prominent under the skin coincide with the outlines of the drawing. In other words, the thickness of the skin is no longer taken into account and, depending on the regions of the body and the morphological characteristics of your model, you might choose to use an element of bone or muscle or fat as the underlying element that gives structure to the form.

We will, in fact, give equal importance to fat, though we will define its shape in a somewhat arbitrary manner, because unlike bones and muscles, fat develops underneath the skin and has no clear boundaries. I have included some sketches to demonstrate the drawing of fat.

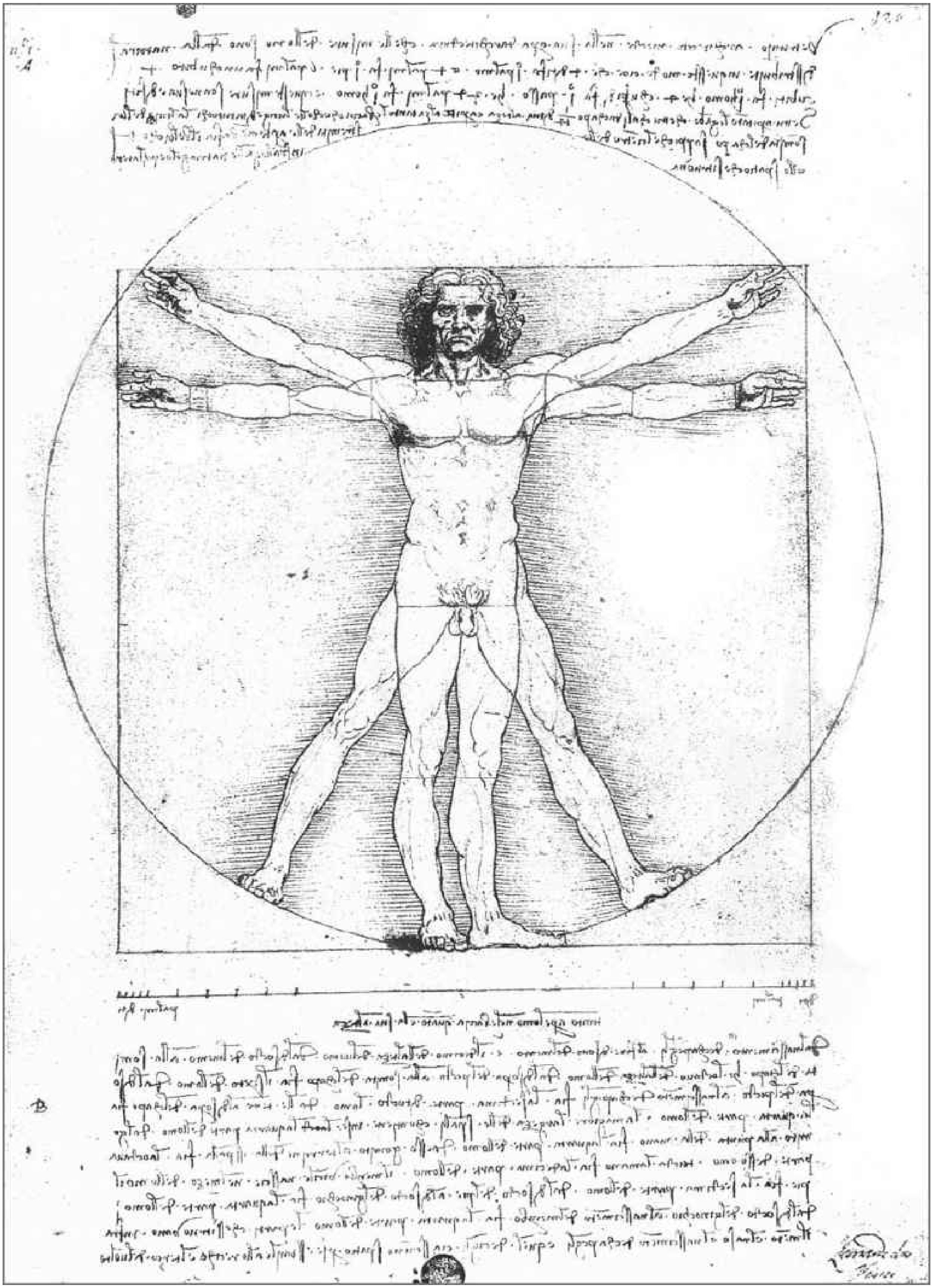


Drawing the Écorché

An écorché drawing can be produced in several stages. First, I suggest you draw the basic composition of your figure using

simple geometric shapes to create the overall silhouette. Check the proportions by measuring the various body parts and compare them to each other. Make sure your vertical lines are true by comparing the silhouette of the model with the vertical lines of the architectural space (assuming you have no actual plumb line) and the boundaries of your frame.

Now it is time to produce the écorché. It is helpful to note on your drawing all of the bone reference points, to graphically distinguish the hard and soft areas. Then connect these reference points beginning with the largest elements, such as the rib cage (with a simple shape like that of an egg), the pelvis (like a large box of matches), and the skull. The orientation of these first elements is essential to express the dynamics of a pose.



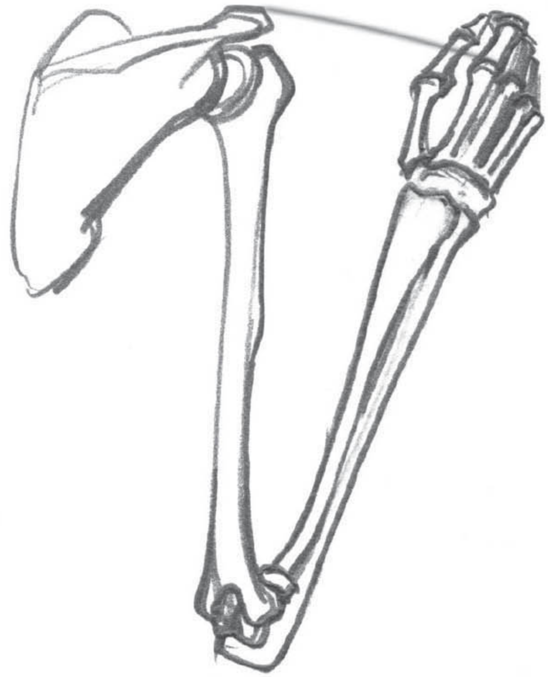
Leonardo da Vinci, *Vitruvian Man*, c. 1490

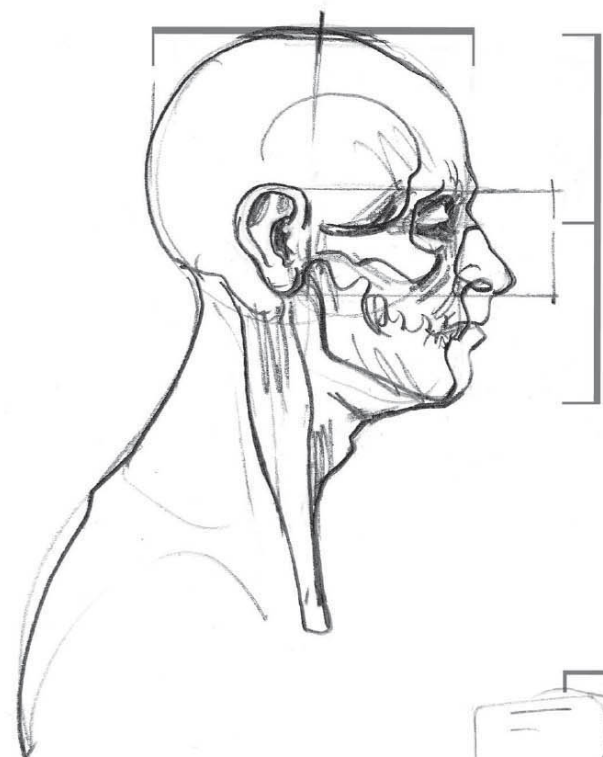
An understanding of the design of the joints and the muscle insertion points should help you to memorize the relationships among the various muscle groups. It will also allow you to understand the mechanics of the human body and to imagine how changes in shape are related to movements (such as stretches, contractions, muscular relaxations, and folds caused by flexion and torsion).

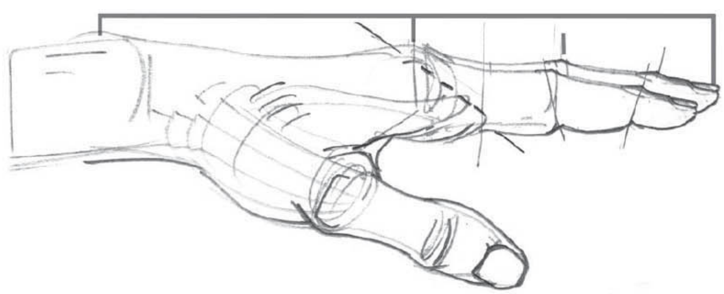
The proportions between the muscles change from one individual to the next, not just in their strength and therefore their thickness, but also in the relationships between their muscle and tendon fibers. A thick muscle will be more powerful. If the muscle fibers are short, the muscle will contract more rapidly. On the other hand, if the fibers are long, the muscle will be more elastic.

Body Proportions

I take inspiration from some of the canonical works on proportions, including those of Leonardo da Vinci and Paul Richer. However, we need to question these canonical formulations every time a new model stands before us. The canons are useful as a way to think of the body in terms of simple and memorable measurements, so we can then use this information as a way to identify the singular characteristics of each individual. Following, I present the basic tenets of the body's proportions.







Head

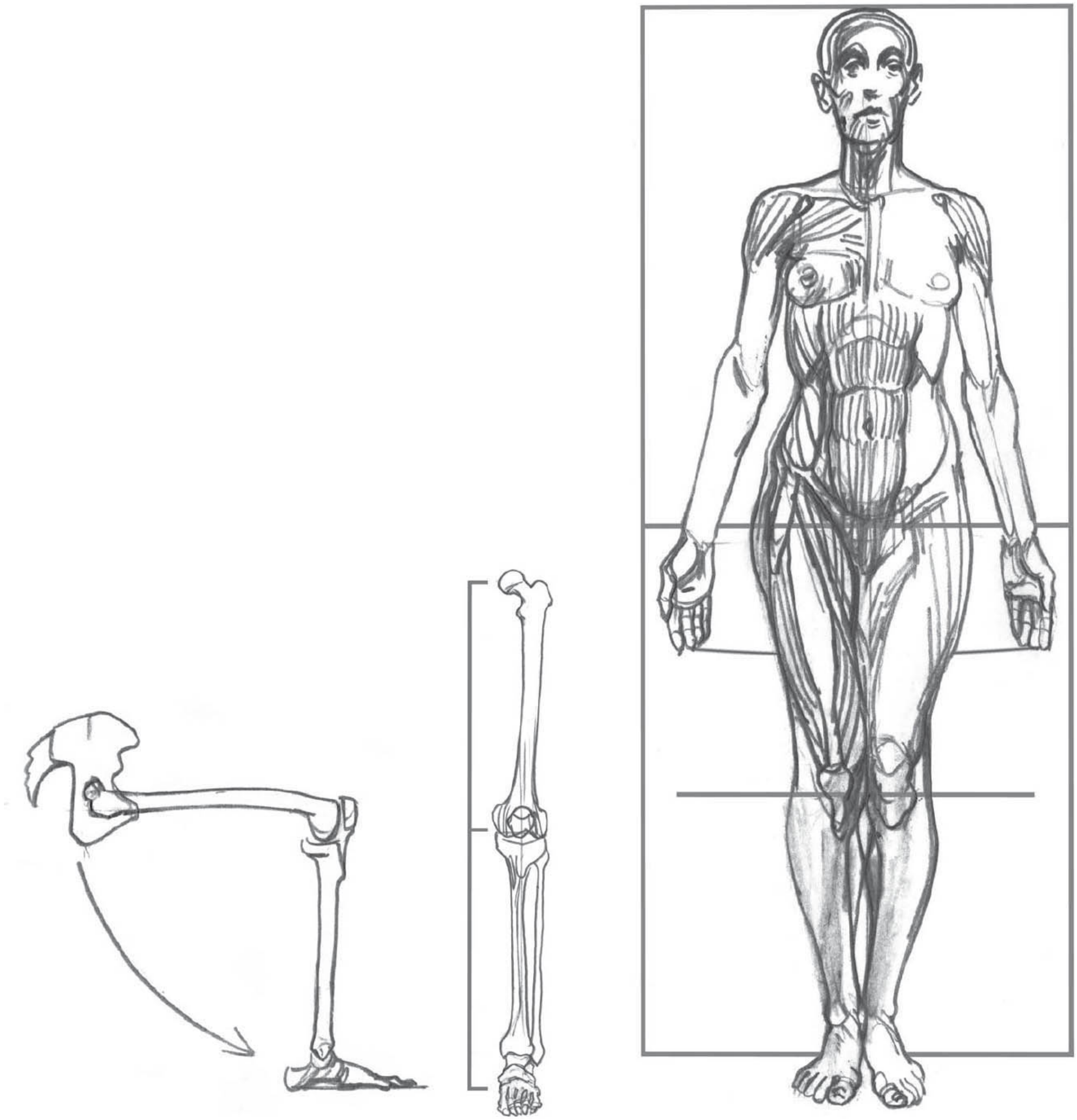
The eyes are situated halfway up the height of the head. This proportion varies with the proportion of the jaw. In a frontal view, the two eyes are separated from each other by the width of one eye.

The ear is level with the nose and situated behind the inferior maxillary joint. Take care to confirm the distance between the ear and the wing of the nose; the most common mistake is to underestimate that distance.

Upper Limb

The distance between the top of the shoulder (the clavicle) and the elbow is equivalent to the distance between the elbow and the heads of the metacarpal bones (the closed fists).

The hand can be separated into two equal segments: from the wrist to the heads of the metacarpals, and from the heads of the metacarpals to the end of the middle finger. On every finger, the length of the first phalange is equal to the combined lengths of the two following phalanx.



Lower Limb

The halfway point from the hip joint to the ground is at the level of the knee joint. Indeed, if the leg is flexed, the heel will be positioned under the buttocks.

Overview

Da Vinci's canonical drawing—which depicts a standing man with his arms spread, inside a circle within a square (see page 10)—highlights a proportional relationship that is useful for drawing: our height corresponds to our wingspan (the distance between the ends of our two hands when our arms are outstretched and aligned). Richer, using multiple measurements and averages, expanded on this rule: a man's wingspan most often exceeds his height, while woman's height most often exceeds her wingspan. The difference between the widths of a man's and a woman's shoulders, which are included in the measurement of the wingspan, explains this discrepancy.

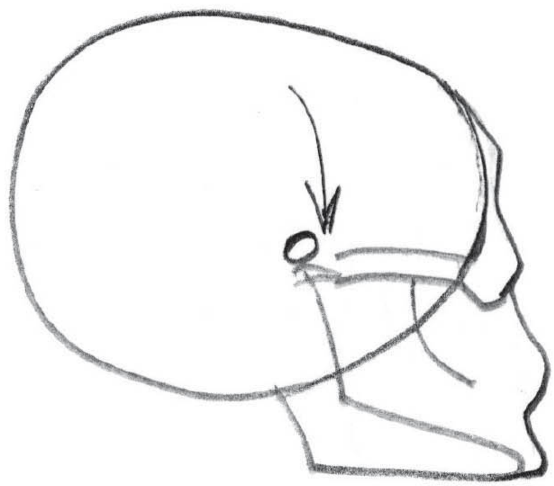
The halfway point of the total height when in a standing position can be found at the pubis, and the quarter point is at the knee joint. With the arms straight down along the body, the end of the hand is at the level of the mid-thigh. The elbow is at the level of the waist.

Balance (Plumb Lines)

Using a plumb line (a simple object hung from the end of a string can do the trick) or a vertical line in your model's environment (a wall angle, door frame, etc.), you will be able to check the alignment of various points on the body and the balance between the different parts. Attention to the plumb line will make it possible to render the weight of the body, its stability or alternatively its imbalance, and the dynamics of a pose.

In profile—with the model in a standing position and with the arms hanging along the side of the body—a vertical line will fall along the ear canal (and the lower jaw joint) and will pass in front of the shoulder, in back of the hip joint, in front of the knee joint, and onto the top of the plantar arch. The spinal column connects with the skull along this plumb line, supporting it from below by curving forward. The spine remains behind the line as far down as the lumbar vertebrae. At the small of the back the vertebrae curves to pass in front of the centerline before rejoining the sacrum behind the line again.

Here we see the front view of a leg while standing, with a vertical line dropped from the hip joint (at the level of the head of the femur). The line will pass through the middle of the knee and ankle joints. Note the direction of the femur: the neck of the femur pushes it to the outside and forces it to rejoin the vertical line at the knee by descending at an angle.



Head and Neck

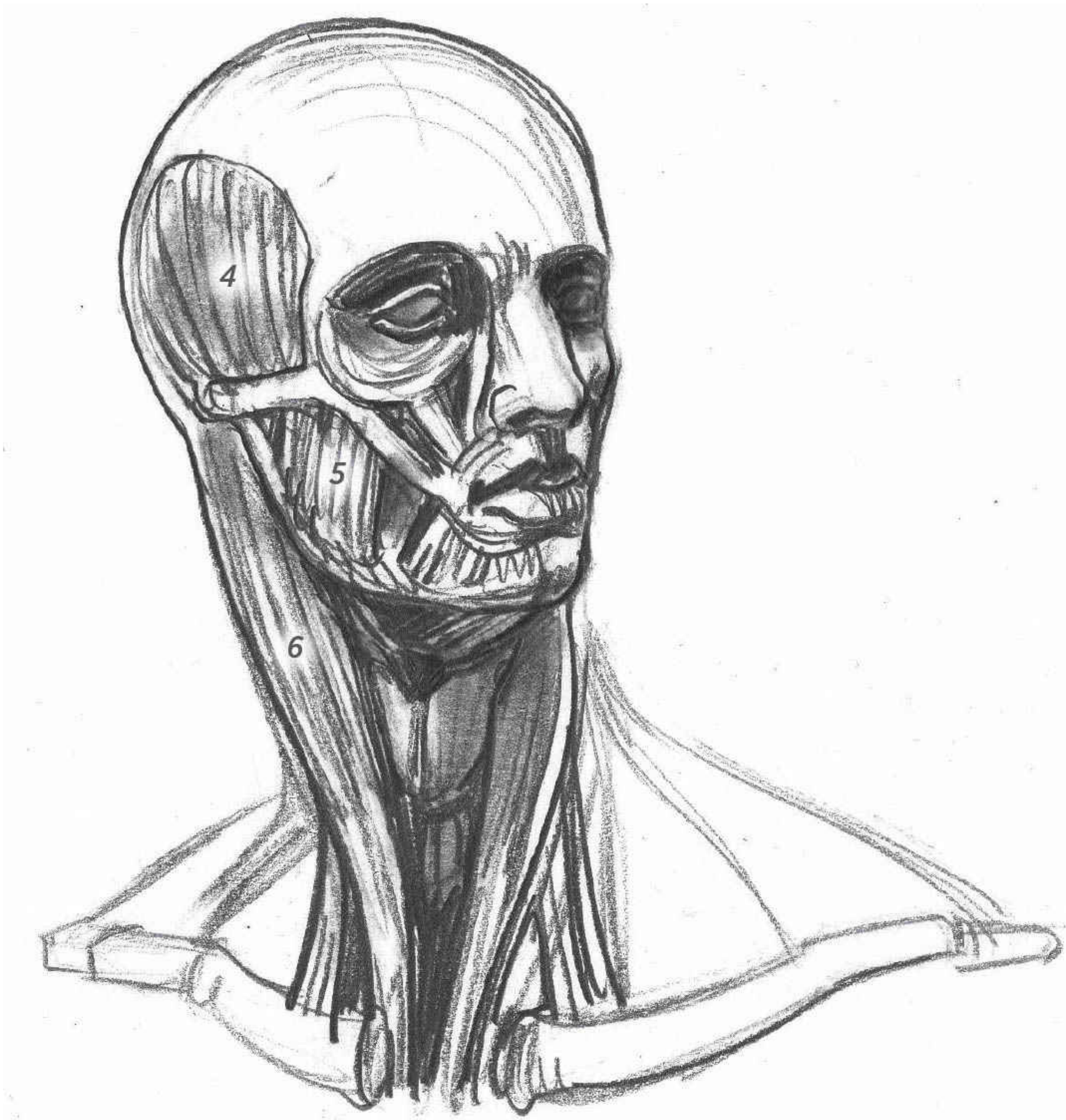
Bone Reference Points

In profile, a skull can be drawn as connecting the ovoid cranial box with the facial bones. The facial bones include the perimeter of the eye sockets, the cheekbones, and the lower jaw, forming a circular arc that curves back up to the ears.

The ear canal is an important reference point for the construction of the skull. Situated at the mid-width of the profile, it is the meeting point between the lower jaw and the beginning of the zygomatic bone, which runs along under the skin up to the cheekbone. You will be able to position the eye

sockets by referring to the proportional rule that, in a frontal view, puts the eyes at mid-height in the face (but remember to reevaluate the position on your individual model).

The Adam's apple, or thyroid cartilage (thy – see front cover flap), influences the shapes in the neck area. It has the appearance, under the skin, of a bone reference point. This cartilage, which is suspended from the lower jaw by a little horseshoe-shaped bone called the hyoid bone, then joins the trachea, which is supported on the axis of the breastbone (the sternum).

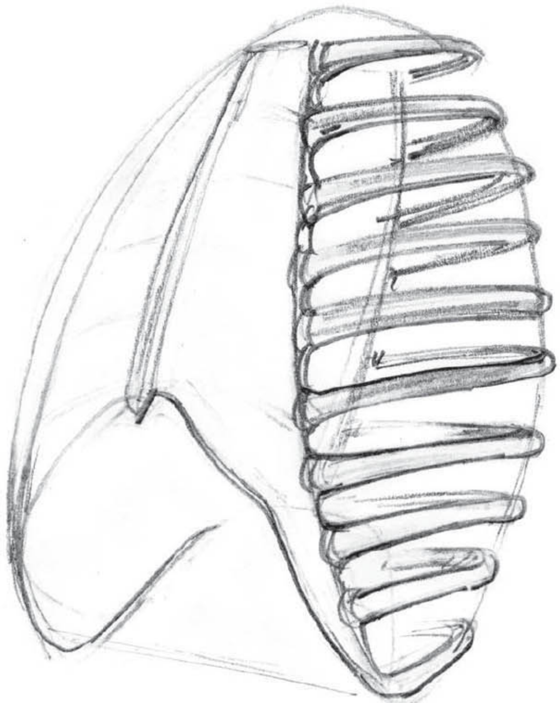


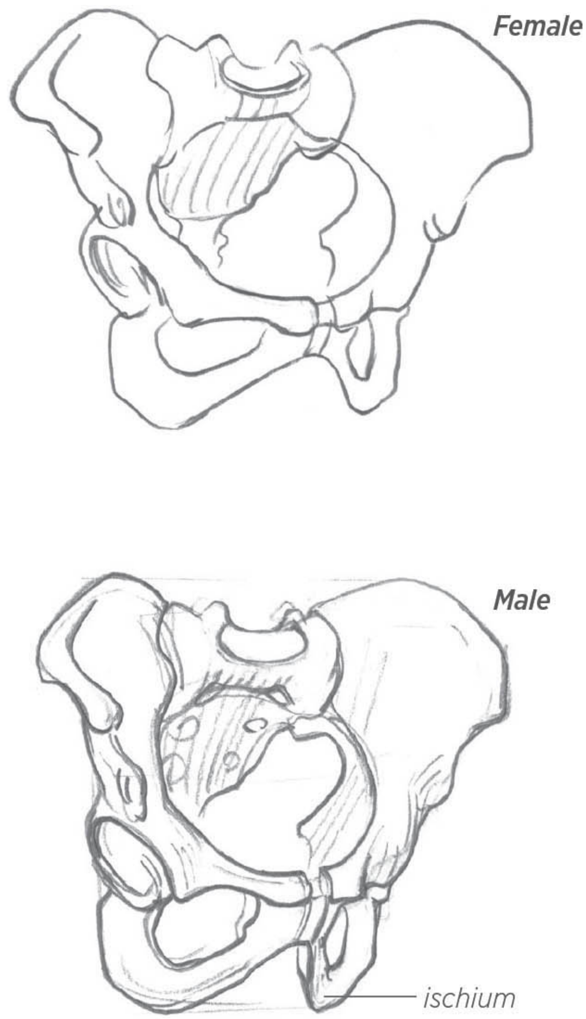
Fleshed Forms

The musculature of the head includes two masticatory muscles that can influence shape: these are the temporal muscle (4) and the masseter muscle (5). Both are connected to the lower jaw. On the face, these muscles are attached to the skin and blend with it. Because an écorché figure has, by definition,

been “undressed” of the skin, it is difficult to describe their impact. These muscles mostly radiate out from the mouth. I don’t think that it’s necessary to know their insertion points; here we will only address their formation, around and within the thickness of the lips.

On the neck, it is advisable to first draw the position the sternocleidomastoid muscles (6), which are highly effective in creating structure. These expressive muscles become vertical when one turns one’s head. They make up the connection between the skull and the rib cage, drawing two beautiful lines that follow the Adam’s apple. The thyroid gland is positioned under the Adam’s apple and can round, or soften, the design of this area, especially among women.





Torso

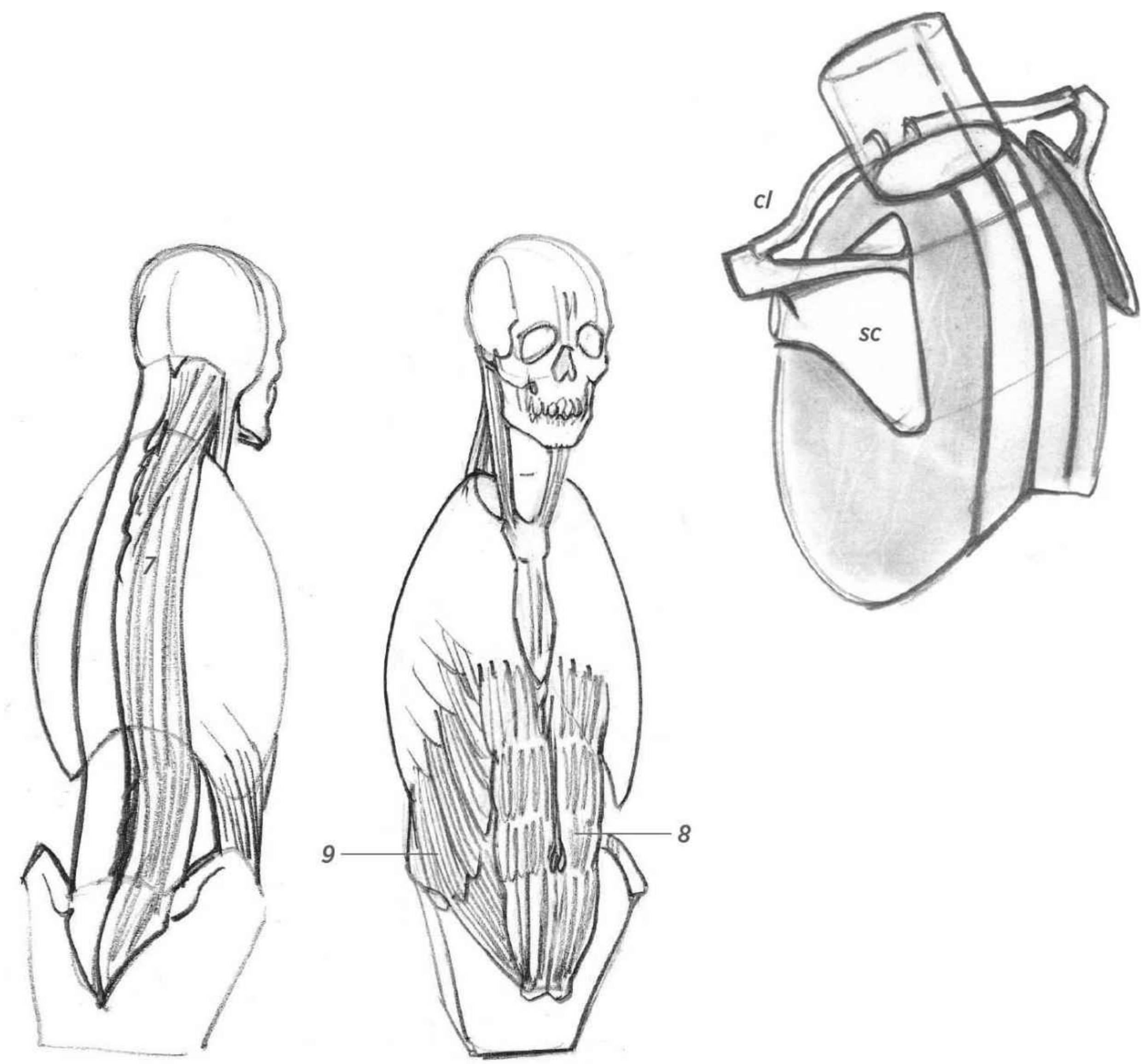
Bone Reference Points

The rib cage has an ovoid shape. Its widest part is usually found just above the waist, and it gently narrows below this level. The space separating the rib cage from the pelvis is smaller than it appears (three finger widths, on average). In certain positions (e.g., bending), the rib cage can actually be positioned inside the pelvis.

The pelvis girdles the lower abdomen and distributes the weight of the upper body across the two femurs, by way of the pelvic ring. The circumference of this ring (about a third of

which involves the sacrum) and the space separating the two ischium bones (the lowest projections on the pelvic girdle), are ways of distinguishing between the male and female pelvis.

In terms of absolute size, the male pelvis is wider. However, in respect to overall body mass, the female pelvis is wider, relatively. The wings and arches that develop above and below the ring provide potential insertion surfaces for the muscles of the abdominal belt and of the thigh.



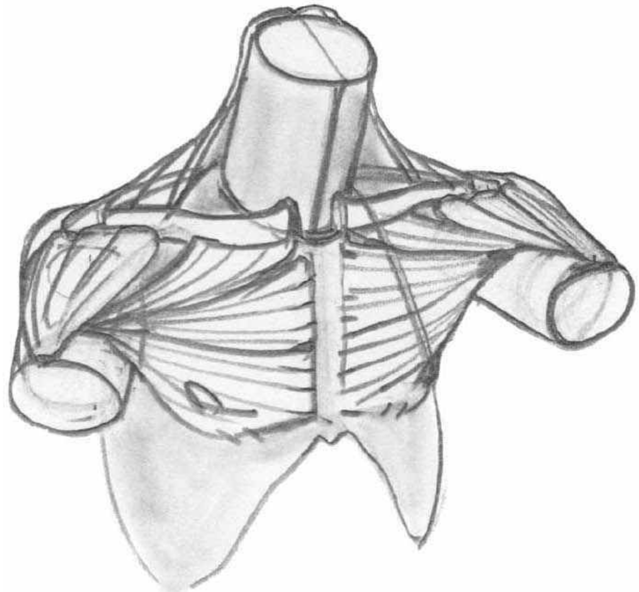
Fleshed Forms

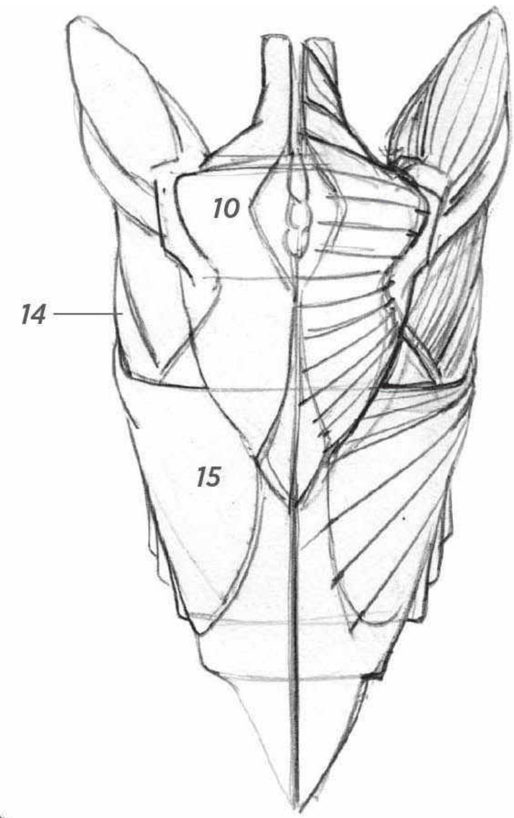
The spinal muscles (7)—the set of muscles that run all along the spine, from the sacrum to the skull—are deep muscles, covered by a superficial musculature, but they are thick and visible enough to deserve our attention. Along with the rectus abdominis muscles (8, abdominals) and the large oblique muscles (9), they constitute a muscular abdominal belt, and together they make up the torso's musculature. These torso muscles, functionally, constitute the "roots" of the arm.

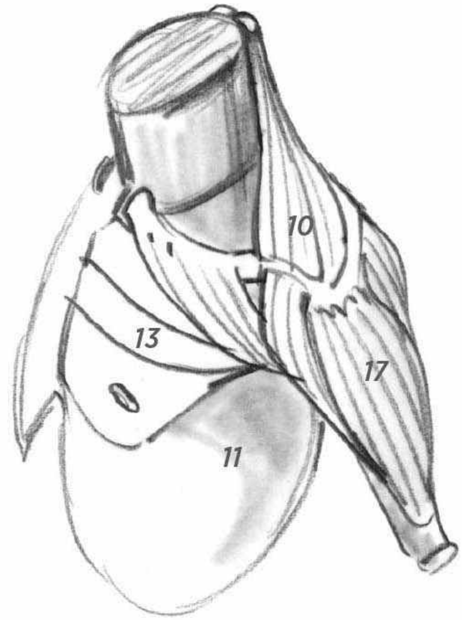
Roots of the Upper Limb

Bone Reference Points

The scapula (sc) and clavicle (cl) can be considered the first bones of the upper limb (i.e., the arm). In terms of mechanics, their purpose is to allow the arm to make certain movements. Every change in position of the arm will result in modifications, often dramatic ones, in the drawing of the torso. In theory, if the scapula were rigidly attached to the rib cage, we would not be able to lift our arm any higher than the horizontal. The scapula has to tilt and turn upwards in order for the arm to be able to lift fully.





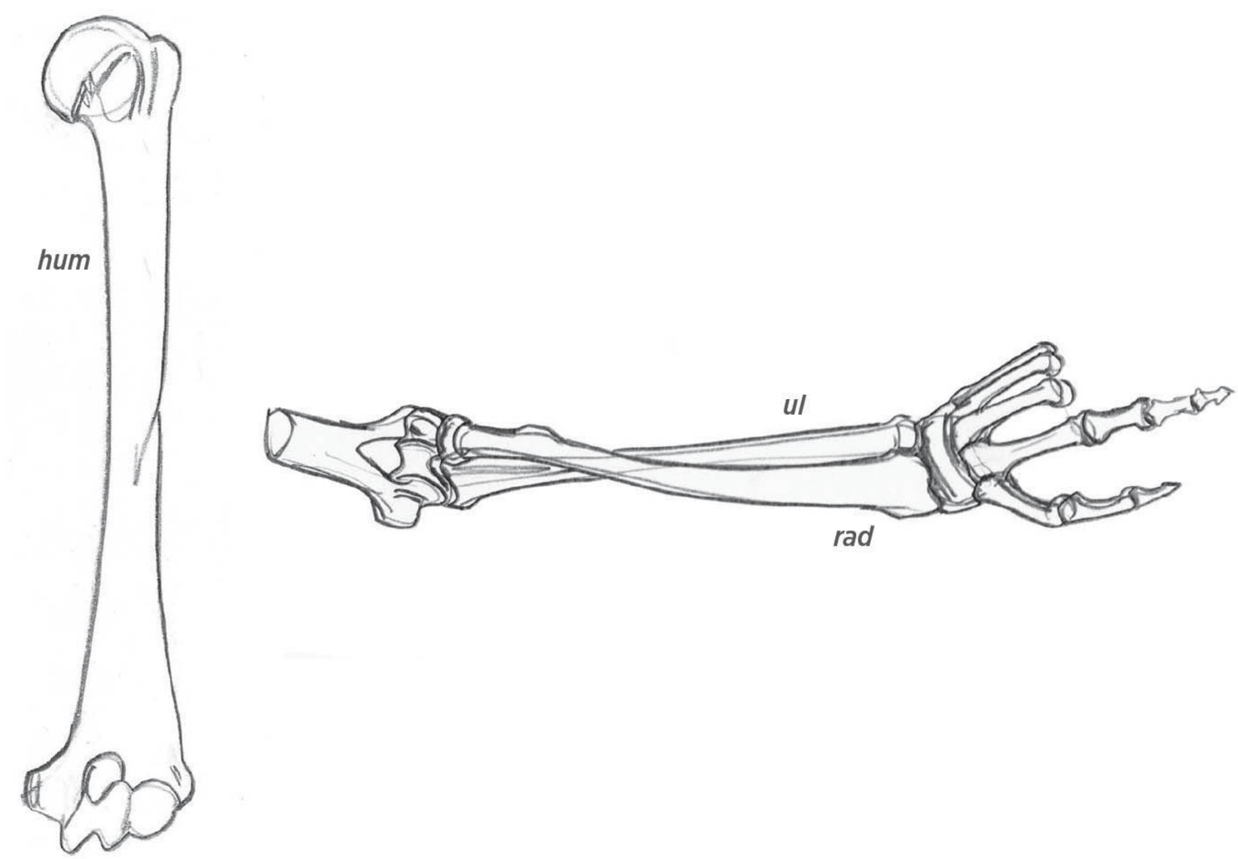


The comparison between human and animal anatomy (comparative anatomy) gives us information about the usefulness of the clavicle, which is absent in many mammals (but that absence promotes other skills), and thus we can note how the musculature of our upper limbs, in combination with our shoulder girdle (scapulas and clavicles), makes it possible for the arm to lift in every direction.

Fleshed Forms

The roots of the arm correspond to the pectoral (13), teres major (14), large dorsal (15), trapezius (10), and serratus anterior muscles. The first three are primarily for lowering the arm and therefore form the walls of the armpit, while the last two, by causing the scapula to tilt and pointing it upwards (relayed by the deltoid, 17) make complete elevation possible.

The breast can be considered as a fat pocket that contains the mammary gland. Kept in a fold of skin, it is thus, so to speak, hooked to the clavicle, and will change shape as it follows the clavicle's movements.



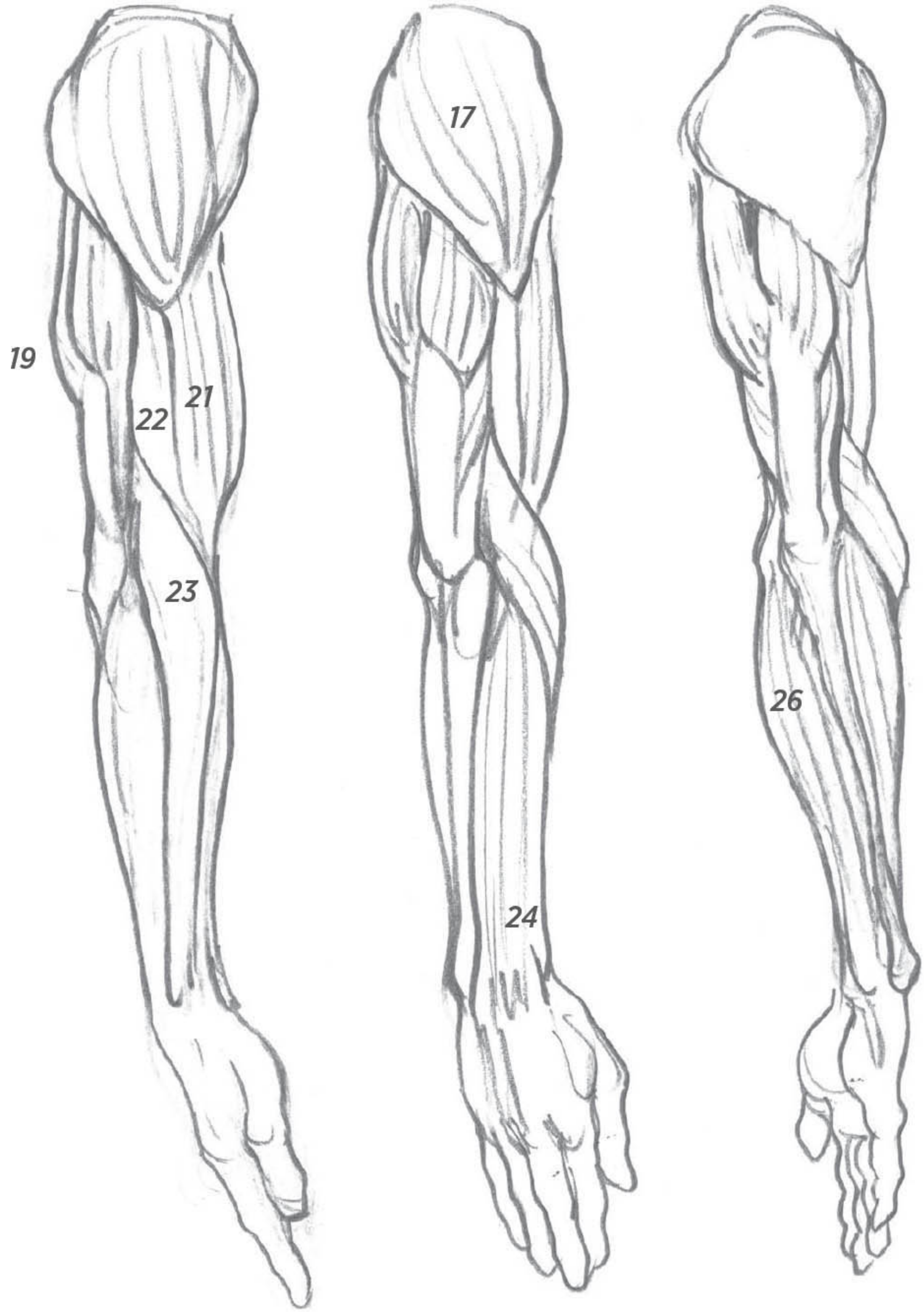
Upper Limb

Bone Reference Points

Even though it is covered by the deltoid, the upper end of the humerus is an important bone reference point. Placed under the connecting point of the clavicle and scapula, it creates a plump form under the muscle.

In the elbow region, this bone ends in a double joint: a sphere attached to a pulley. The sphere is joined to the radius (rad) and is what makes the hand's rotational movements possible. The pulley is connected to the ulna (ul) and allows for movements of flexion and extension. On an écorché of the elbow, the ulna is outlined down as far as the rounded projection that is found near the wrist, on the same side as the little finger.

The shape of the back of the hands and fingers is essentially a result of the skeleton. The small wrist bones are very similar to each other except for two of them that can be found on the "heel" of the hand. One can find a spherical joint (a rotation) on the heads of the metacarpals at the end of the closed fist. But it is the pulleys (for flexion and extension) that separate the different phalanges from each other. Note that there are two phalanges on the thumb and three on each of the other fingers.

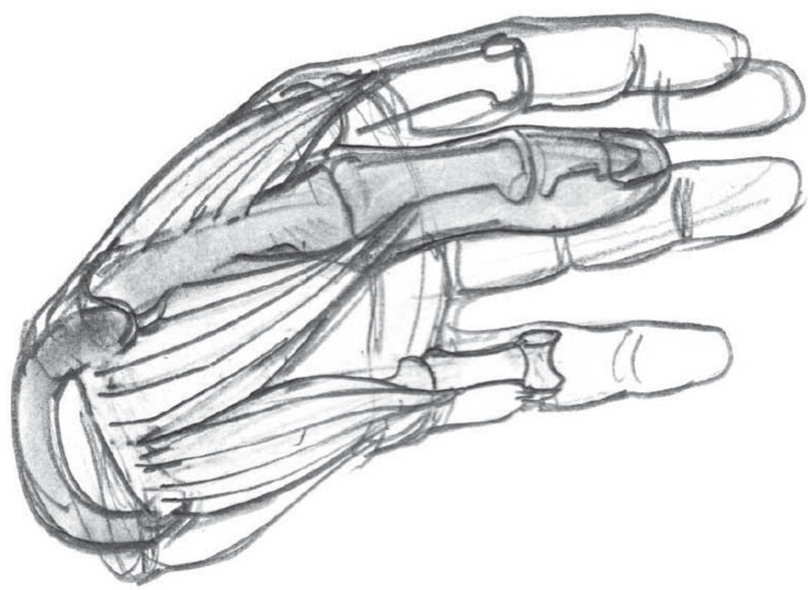

17
19
21
22
23
24
26

Fleshed Forms

The deltoid muscle (17) caps the shoulder joint and takes part in the elevation of the arm. It has a triangular shape, and its downward-pointing tip is often masked by a fatty mass that extends and is mistaken for the triceps (19).

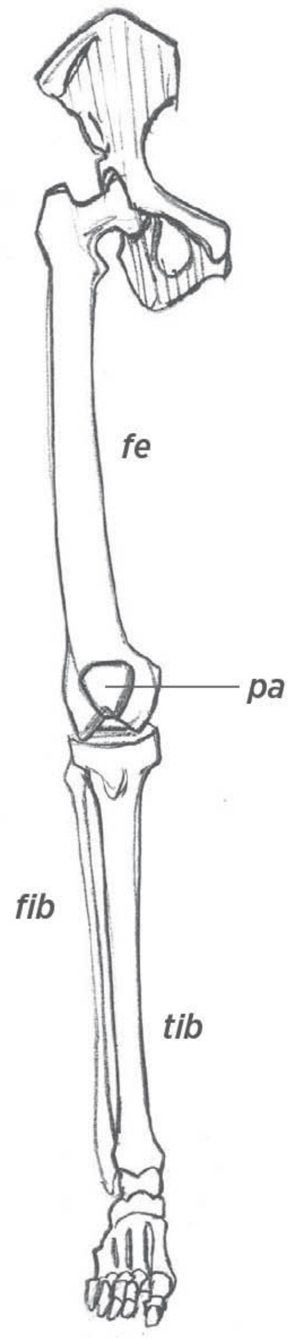
We will contrast the three bundles of muscle that make up the triceps (three bundles that connect with a shared tendon) with the biceps (21, which has two muscle bundles that share a tendon), the brachial muscle (22, which I will not always show in my drawings for the sake of simplicity), and the brachioradialis muscle (23). The triceps are the extensors for the forearm, while the others are flexors.

The simplified version of the forearm includes three sets of muscles: to the brachioradialis muscle already mentioned (most often confused with the first radial), we should add the extensors (24, for the hand and the fingers, including the thumb), and the flexors (26, for the hand and the fingers). The so-called “anatomical” position (with the hand open and the thumb facing out in a front view) has often been featured in anatomical works, because it makes it possible to see the bones of the hand and of the forearm in a flat plane, whereas, if the thumb is brought back to the inside, the bones cross over. In order to understand the musculature, however, it is better to start from a natural position: with the hand hanging down along the side of the body, the palm facing the thigh. In this position, the extensors, which hook to the outside of the humerus, are in a straight line with the back of the hand. As for the flexors, starting with the internal extremity of the humerus, they are in a straight line with the palm. Finally, the brachioradial muscle slips in between the two previous groups.



The hand can be compared to a pair of pliers, with a capacity for gripping inscribed in its resting forms. The thumb's capacity to meet the other fingers makes its orientation paramount. This can be rendered if care is given to its volumes, jointed folds, and nails. The mobility of the thumb and the relative mobility of the little finger require the

presence of muscles at their base, which contribute to making the palm fleshy. However, underneath the hand, fat also plays an important role. It protects the bony extremities much like a cat's paw pads. This fat is situated under the heads of the metacarpals and underneath each phalange. It is what makes the palm appear longer than the back of the hand. The heads of the metacarpals, which are uncovered on the back of the hand, are shrouded on the palm. It is this discrepancy between the two sides of the hand that explains the folds on the palms, as well as the beveled design that allows the two sides of the hand to touch, between the fingers. As for the lines on the hand, they are flexion folds for the thumb (so-called lifelines) and for the fingers (so-called heart lines and head lines).

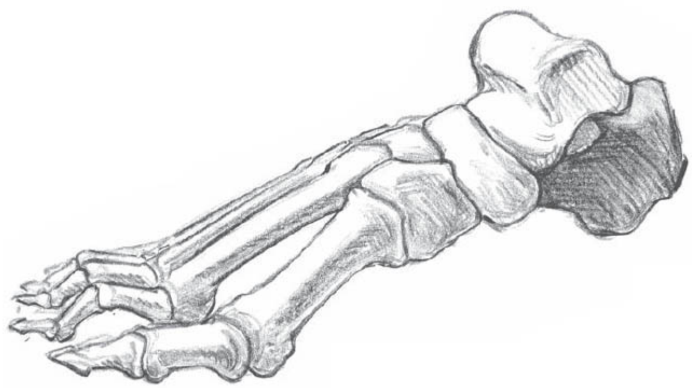


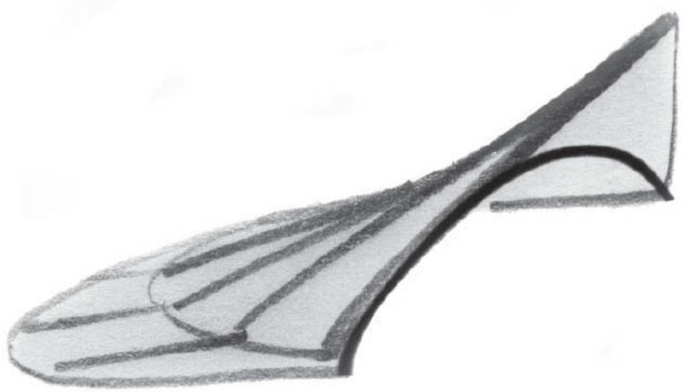
Lower Limb

Bone Reference Points

The pelvis marks the boundary between the torso and the lower limb and is visible at the top, and the ends of its wings are visible underneath the flank. The genitals are outlined underneath the pubis, masked by the fat in that area and, most often, by the pubic hair. At the back, the sacrum (sacr) is surrounded by three bone markers that delineate it under the skin, namely the beginning of each of the two wings of the pelvis, above, and the beginning of the line of the buttocks, below.

The femur (fe), at the level of the hip joint when it is not veiled by fat, is outlined under the skin. This bone reappears at the knee, behind the patella (pa), a small mobile bone enveloped in the quadriceps tendon. At this level one can easily see the tibia (tib) under the skin; it remains underneath the skin down to the ankle (the internal malleolus). The fibula (fib) is only visible at its two extremities, and is also a part of the shape of the ankle (the external malleolus).





To fully understand the foot, it is important to be familiar with its bone structure. The foot is designed with a natural arch. Its role is to withstand the body's shocks and weight. The plantar arch takes this dynamic into account inside the foot, as we know, but also on top of the foot (we will not deal with the outer arch here). Thus, the foot is convex, and unless you are dealing with a flat foot, this form should be respected, from

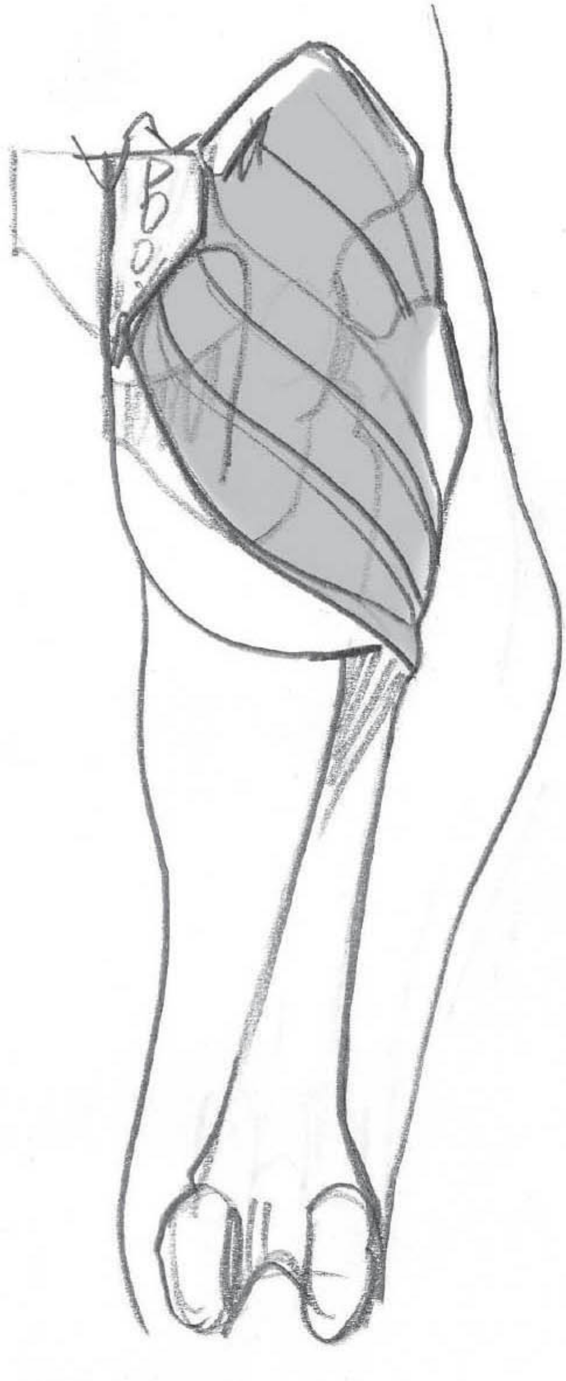
the ankle to the heads of the metatarsals.

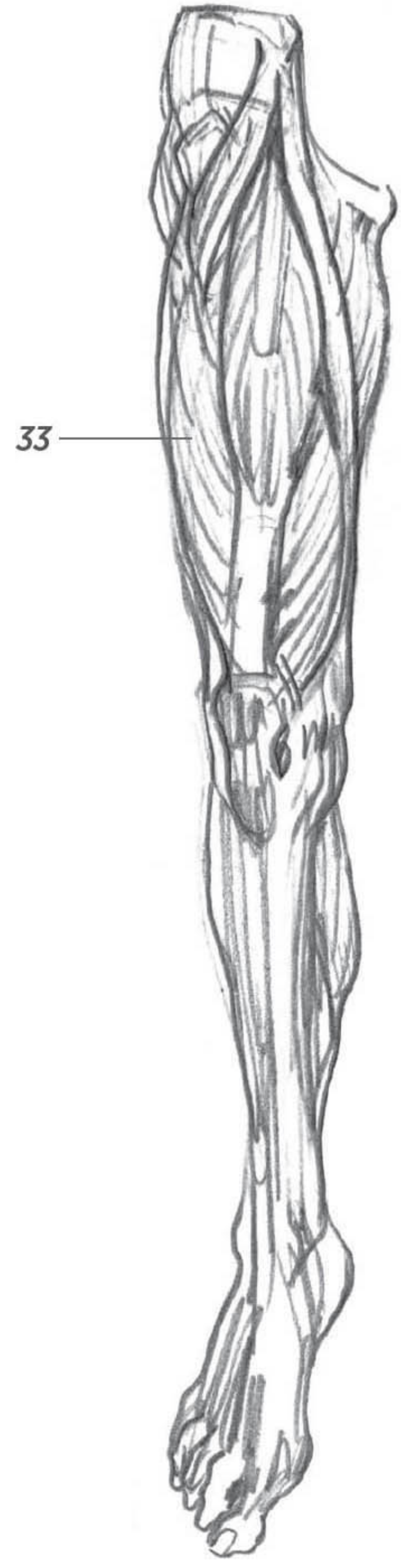
To this schematic vision, we should add another note: the entire foot skeleton has a spiral shape. The foot, raised up on its inner edge (on the side of the higher malleolus, or ankle bone), lowers itself gradually toward its outer edge (the lower ankle bone).

Thus, we can distinguish a dynamic part (the internal arc associated with the abductor muscle and the big toe) and a static part (the three last metatarsals and the toes associated with them).

Fleshed Forms

The pelvic wing offers a large surface of insertion into the gluteus medius (31), sometimes called the "deltoid of the hip." The gluteus maximus (32) follows it, inserting itself as far as the sacrum. There are many écorché versions of this region. I prefer to accentuate the main part of this muscle, which connects directly to the first third of the femur, slipping itself between the quadriceps (33) and the hamstrings (34, next page).

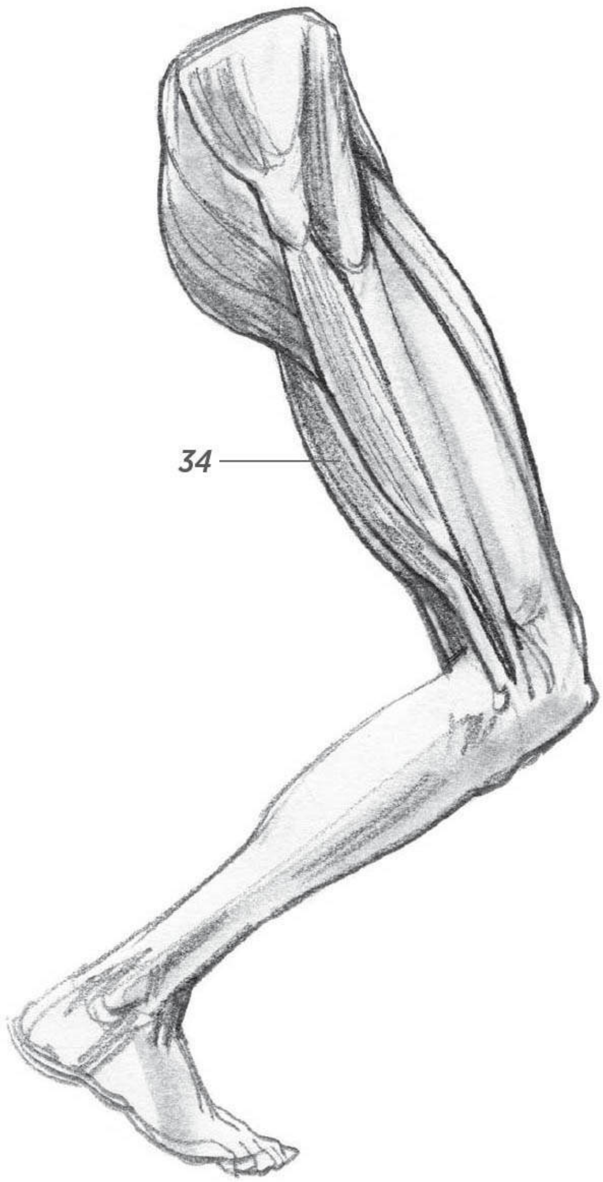


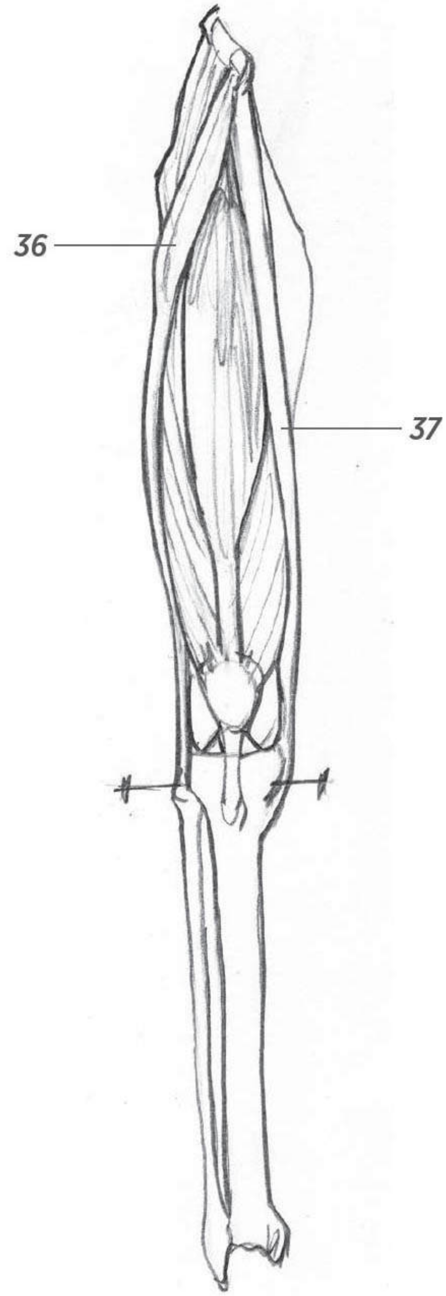


A common mistake is to confuse muscles and fat in the

area of the buttocks. The outline of the buttocks is due to fat so it is difficult to evaluate the muscular proportions there. We can only guess at it by relying on the proportions in other parts of the body. At any rate, it seems more interesting to me to try to simplify and synthesize the fatty shapes here. Without the fat, and with the gluteus maximus taking the most direct path from the sacrum to the femur, we would not have the groove of the buttocks, whose length depends precisely on the thickness of the adipose tissue.

The quadriceps, as the name suggests, are made up of four muscle bundles that meet at a shared tendon, which, after having enveloped the patella, is inserted into the tibia. Of these bundles, we will only retain the three most important. The fourth one, which is a deep one, cannot be drawn. While the two lateral bundles start at the femur, which imposes its direction on the muscle, the central bundle connects to the pelvis and meets the others on the tibia.

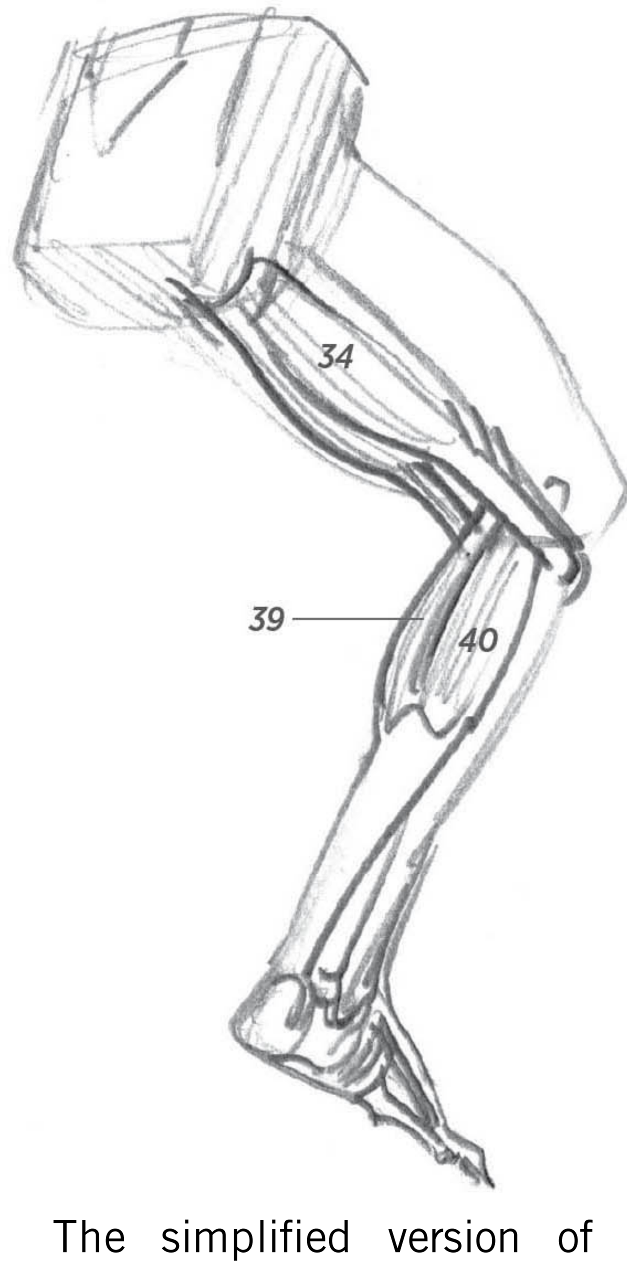




The tensor of the fascia lata (36) is a muscle with a very particular mode of insertion. Here, again, I had to make a choice. One has to imagine that the quadriceps, like all muscles, are wrapped in a fibrous “stocking” that contains them and gives them their shape, accompanying its fibers into the depths, all the way to the skeleton. This stocking (the fascia) continues up the leg, wrapping the knee in passing.

The tensor, when it is contracted (flexed thigh) or tensed (stationary hip), will tend to stretch the fascia and to give it the shape of a long ribbon, which can be seen along the side of the quadriceps and of the knee. The tensor of the fascia lata and the sartorial muscle (37) seem to work together, enclosing the thigh before connecting with the knee under the joint, as though to reinforce it on both sides. Their layout vaguely resembles the reins of a harness connecting with a jaw bit at the level of the knee.

I also propose a simplified version of the hamstrings. We will reduce these muscles to two long spindles, which, starting from the ischium (the lowest point of the pelvis), move apart as they descend, allowing the gemelli (39 and 40), behind the knee, to slip between them. When the leg is flexed, the hamstrings (34) end in two long, beautiful tendons on each side of the hollow at the back of the shin.

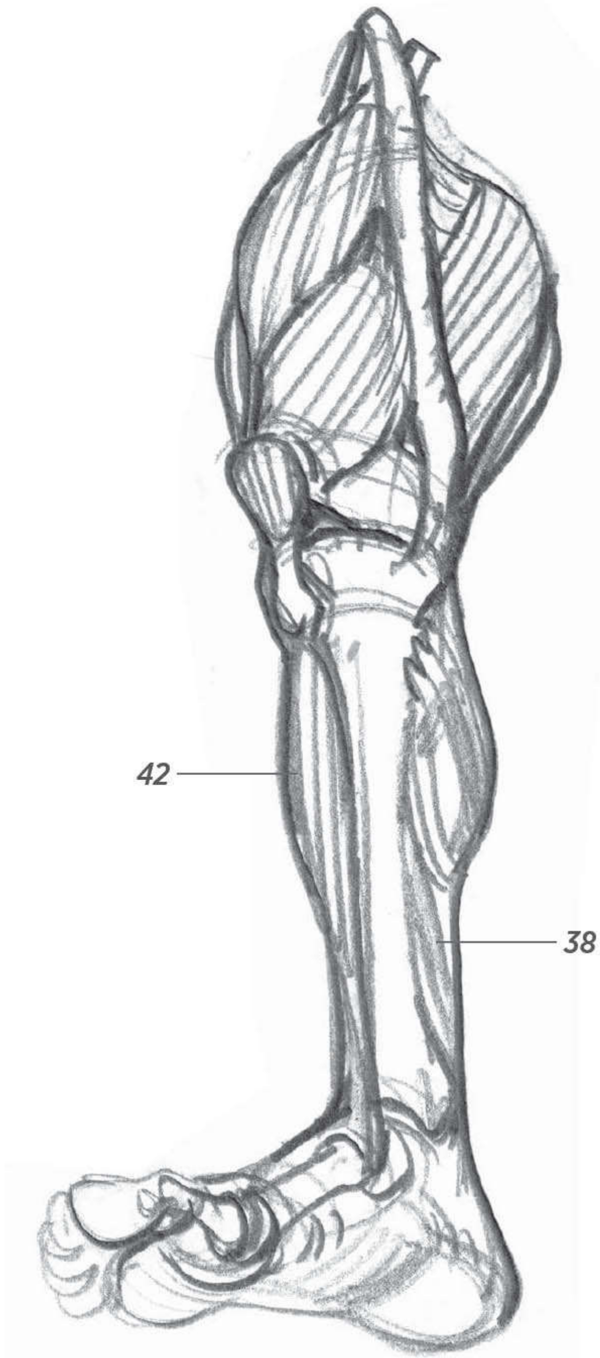


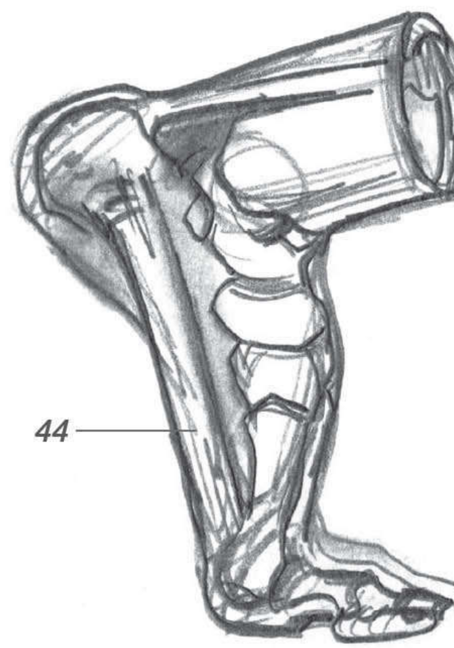
The simplified version of the adductors (35) involves considering only the strongest bundles and giving them all just one name. This is especially true because these muscles are most often hidden under a thick level of fat that starts at the

beginning of the thighs and narrows as it moves downwards.

There is a symmetrical fatty spot on the other side of the thigh, under the hip joint; this is a typically feminine configuration. If we compare the lower and upper limbs, this fatty spot is reminiscent of the one that can be found behind the tip of the deltoid. In general, a simplified way of describing this is to say that the fatty layer becomes smaller as it moves from the root to the extremities of the limbs.

The gemelli and the soleus muscle (38), taken together, form a triceps. Their shared tendon is none other than the Achilles, which inserts itself into the heel (calcaneus), forming a powerful lever. In the front of the leg, the extensors (42) are reminiscent of those of the forearm: in both cases, the bundles start on the outside and then rotate as they move down, to insert into the back; in one case the back of the foot, in the other the back of the hand.



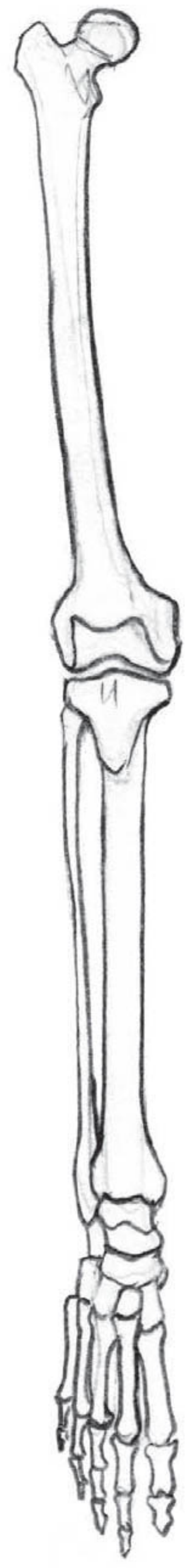


The foot is designed like a bow, with the skeleton corresponding to the wood of the bow and the “string” being the abductor muscle (44) of the big toe. This construction of the foot can be seen in the footprint it leaves on the ground. But that footprint can also mislead us about the strength of the foot’s dynamics, because the arch may be masked by the

fat in that area. This fat is reminiscent of the fat on the hand, and obviously is involved in the foot's shock-absorbing role, providing a veritable mattress atop the bones. As on the hand, we find the skin folds and the beveled plane between the toes, for the same reasons.

Similarities Between Arms and Legs

The task here is to compare the skeleton of the upper and lower human limbs. For certain animals, we could take the comparison as far as the scapular (scapula, clavicle) and pelvic girdles, but for the purposes of this book, that will not be necessary.



On both limbs, the lower and the upper, there is only one bone on the first segment: the humerus and the femur, respectively. Then, on the second segment, there are two bones: the radius and the ulna on the arm, and the tibia and the fibula on the leg. Then come the small bones of the wrist, which could correspond to those of the instep. Finally, there are five fingers on the hand, corresponding to the five toes on the foot, with the same number of phalanges on each extremity, and in both cases one fewer on the thumb and on the big toe.

As we saw earlier, the muscles that operate the hand and the foot are inserted above the wrist and ankle joints, and rest on the paired bones of the forearm and leg, respectively. It would seem that the complexity of the extremities, in particular the number of digits (and here a comparison with the anatomies of various mammalian species is very informative), determines and necessitates the enlargement (on the same plane as the hand or foot) of the insertion zones. It is the paired juxtaposition of the bones, the radius and ulna on one hand and the tibia and fibula on the other, that makes this possible.

The simplest formation is the one we find on the lower limb (with the tibia and fibula always remaining parallel). On the forearm, the ability to cross and uncross the two bones facilitates rotation and increased movement in the hand such as pronation and supination.

drawings

Note to reader:

Keys to the illustrations are located at the end of the book.

The tables are also available as downloadable PDFs from this URL: www.rockynook.com/morpho_tables

head and neck

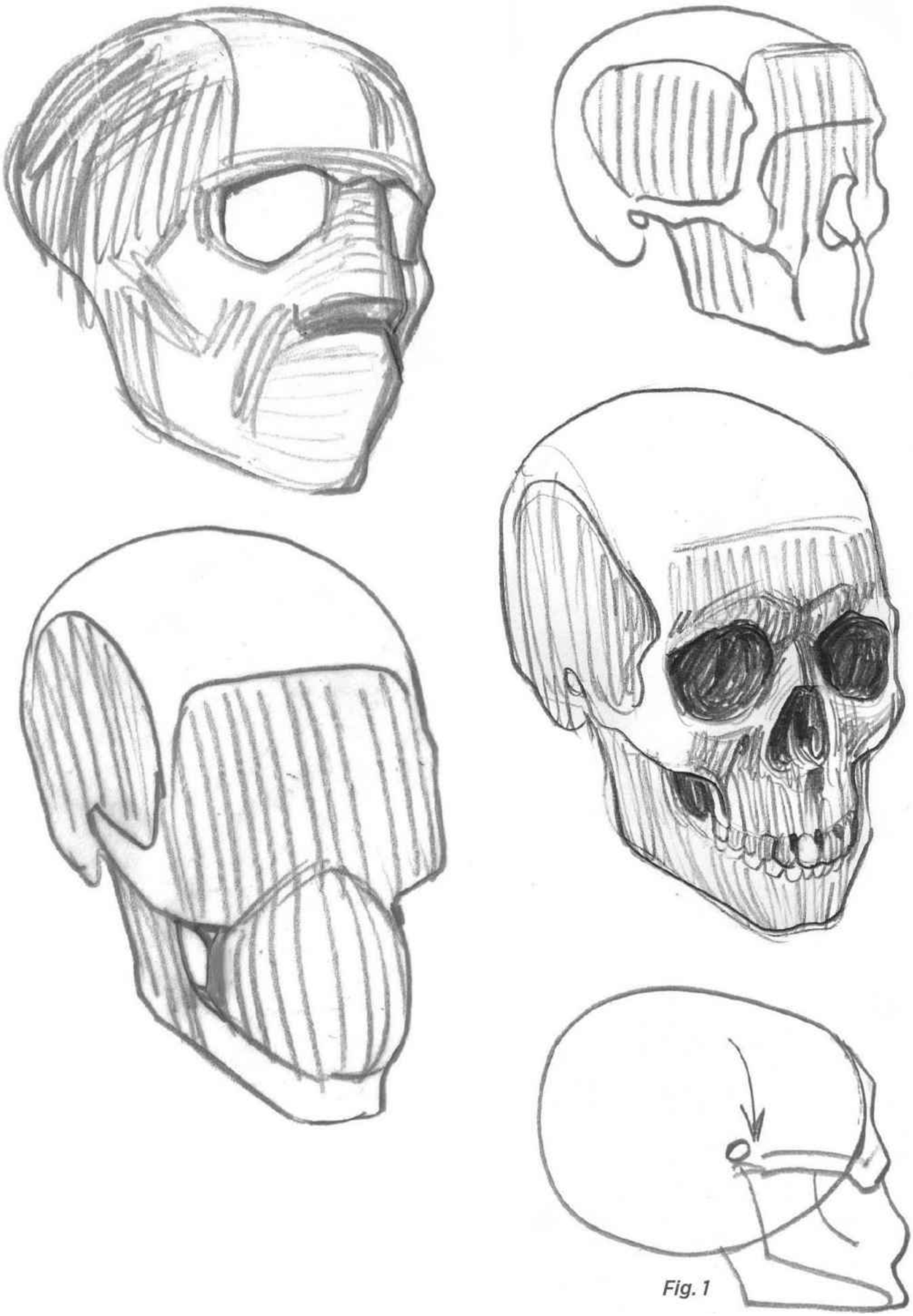


Fig. 1

Fig. 1: *The zygomatic arch (the cheekbone) and the lower jaw (inferior maxillary) joint join in front of the ear canal*.

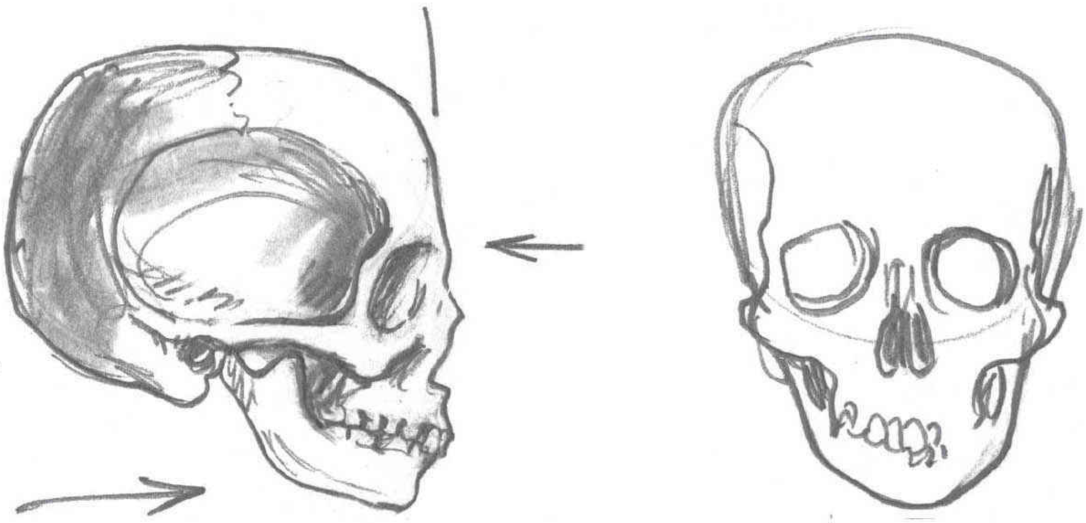


Fig. 2

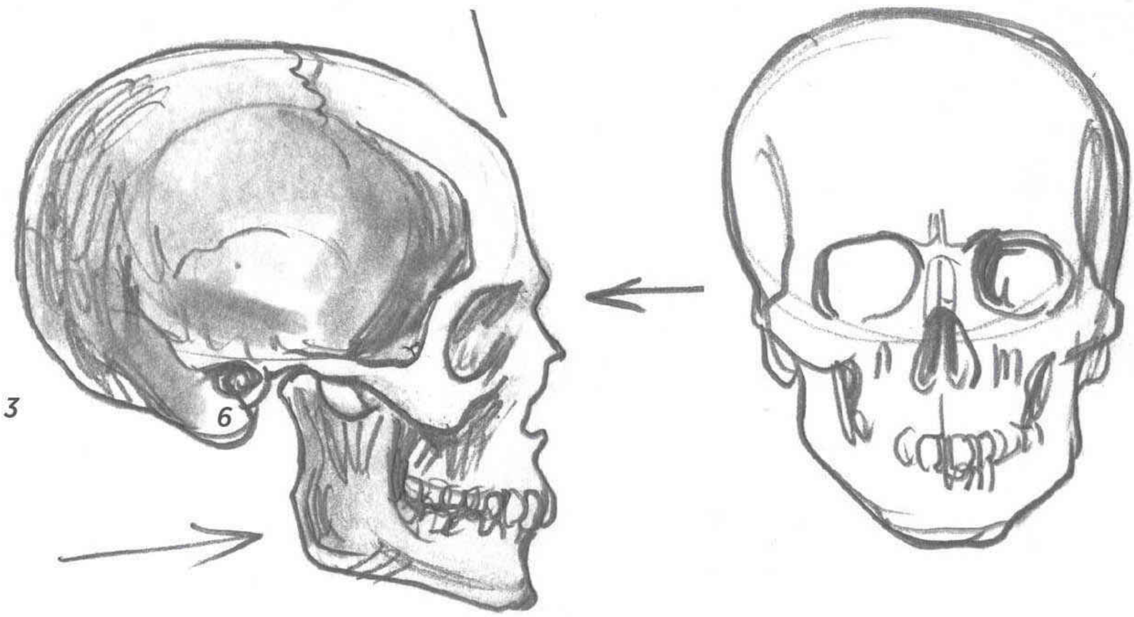


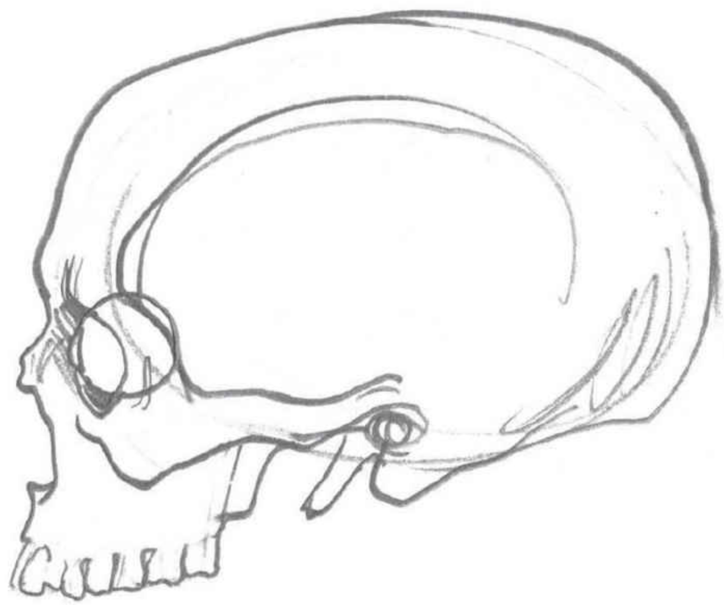
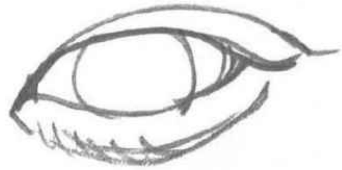
Fig. 3

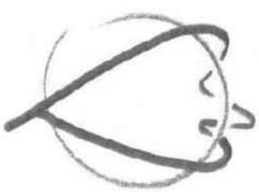
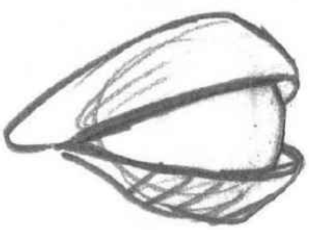
Male and Female Characteristics

The female skull (Fig. 2) has a more vertical forehead, more prominent frontal knobs, and larger openings (eye sockets and nasal cavities) than the male skull.

The male skull (Fig. 3) has a more receding forehead, more prominent brow bumps, and stronger jaws and teeth. It is more resistant and thicker, at the expense of the openings. The angle of the jaw is

steeper, as is the insertion of the sternocleidomastoid (6).

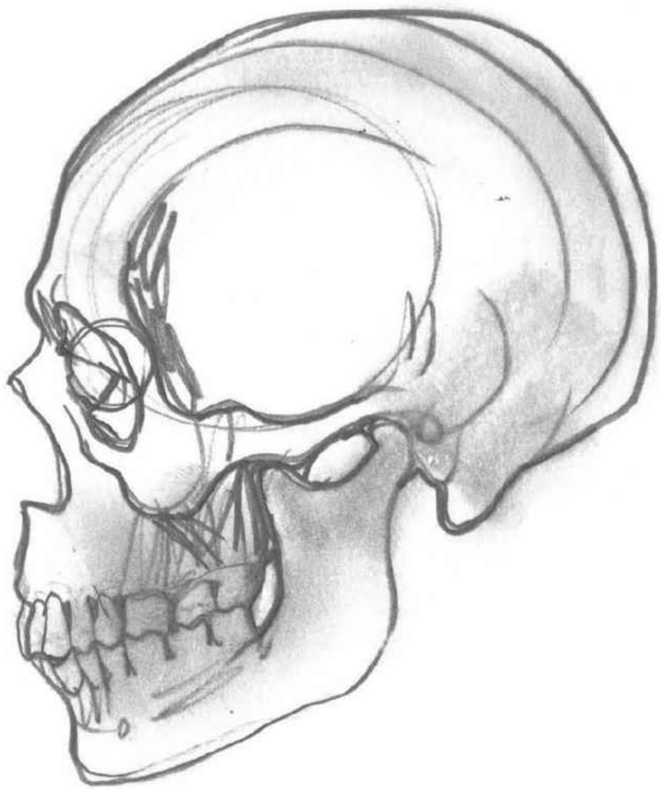


Fig. 1

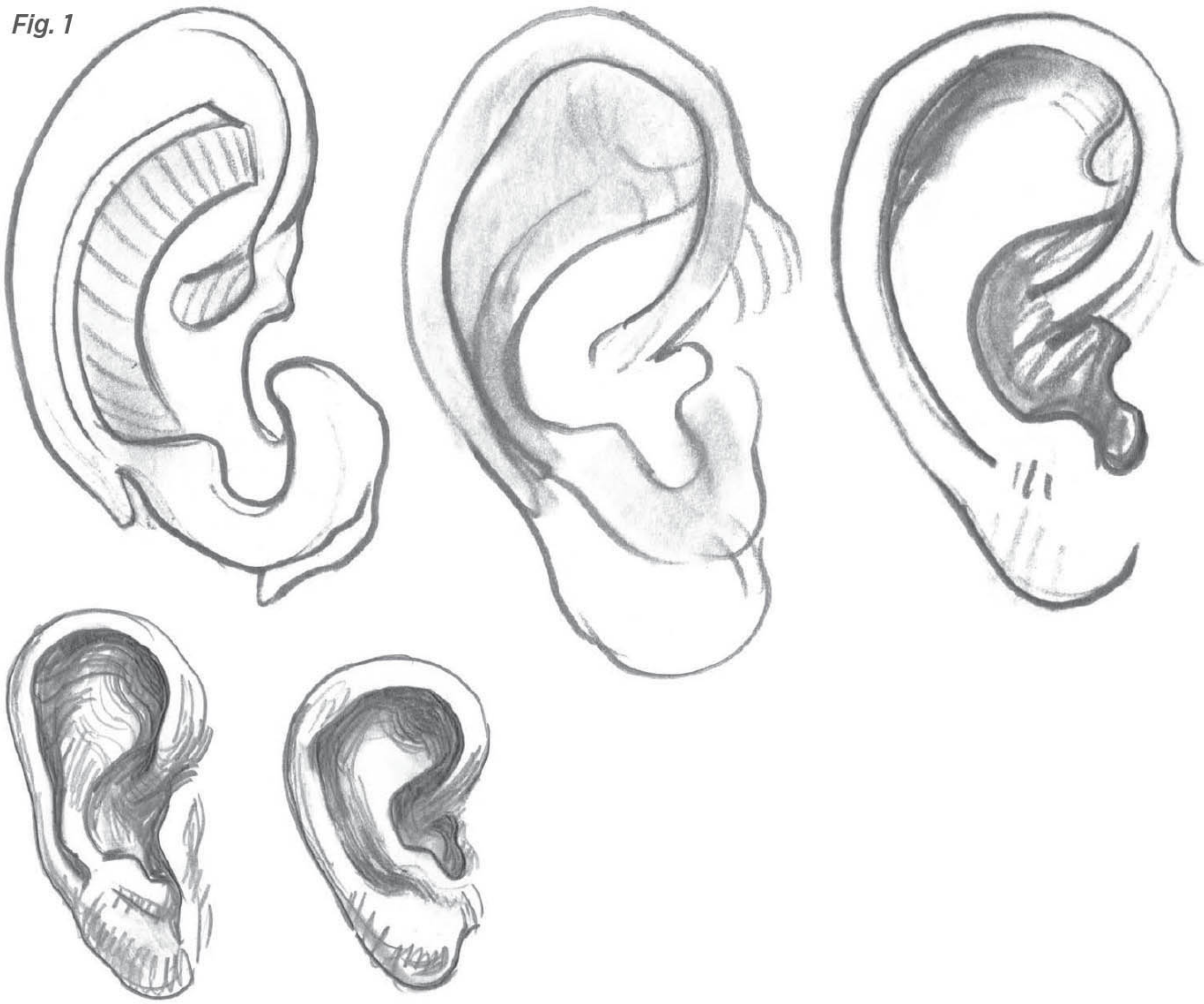


Fig. 1: *Only the cartilage of the ear is shown.*

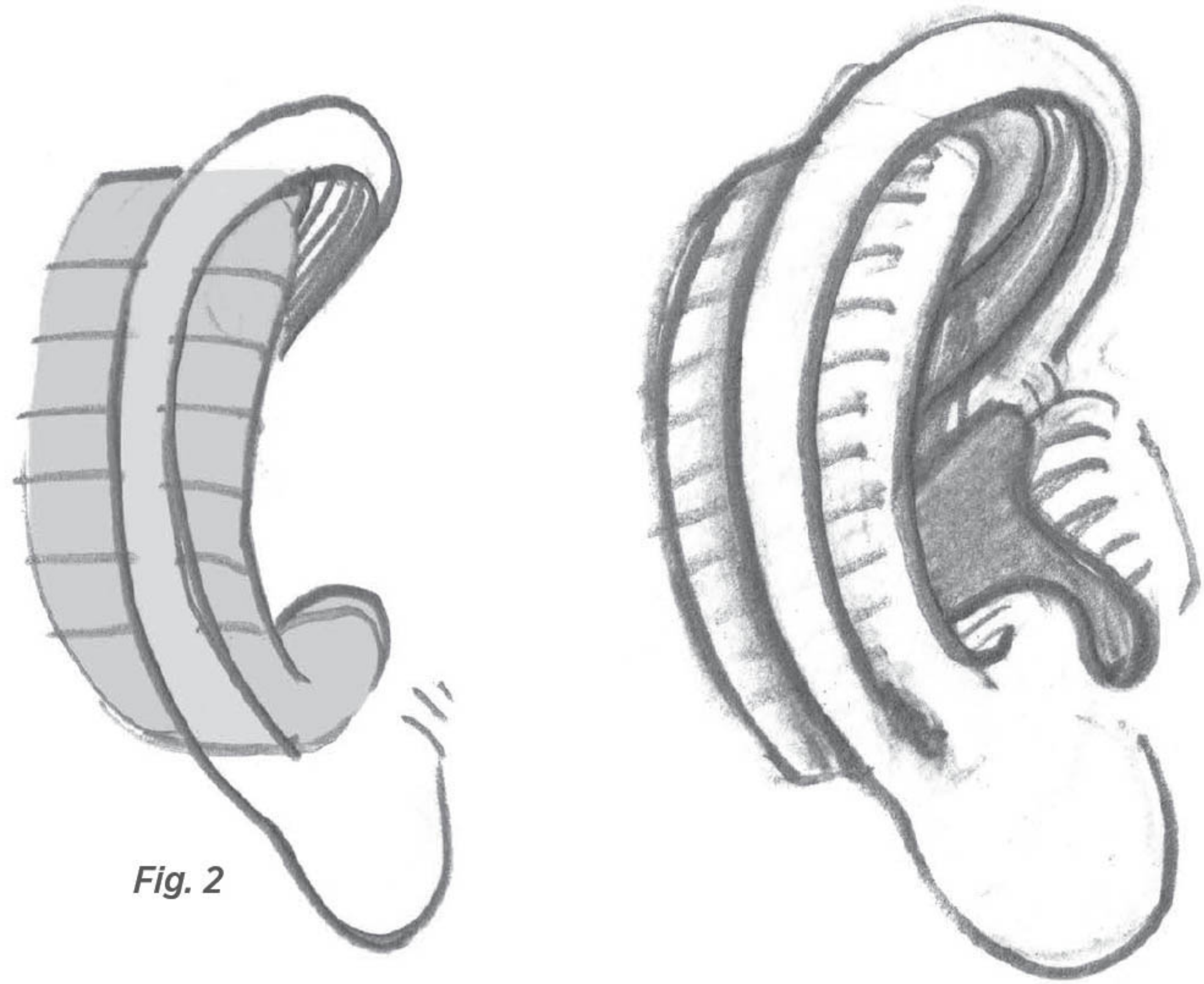
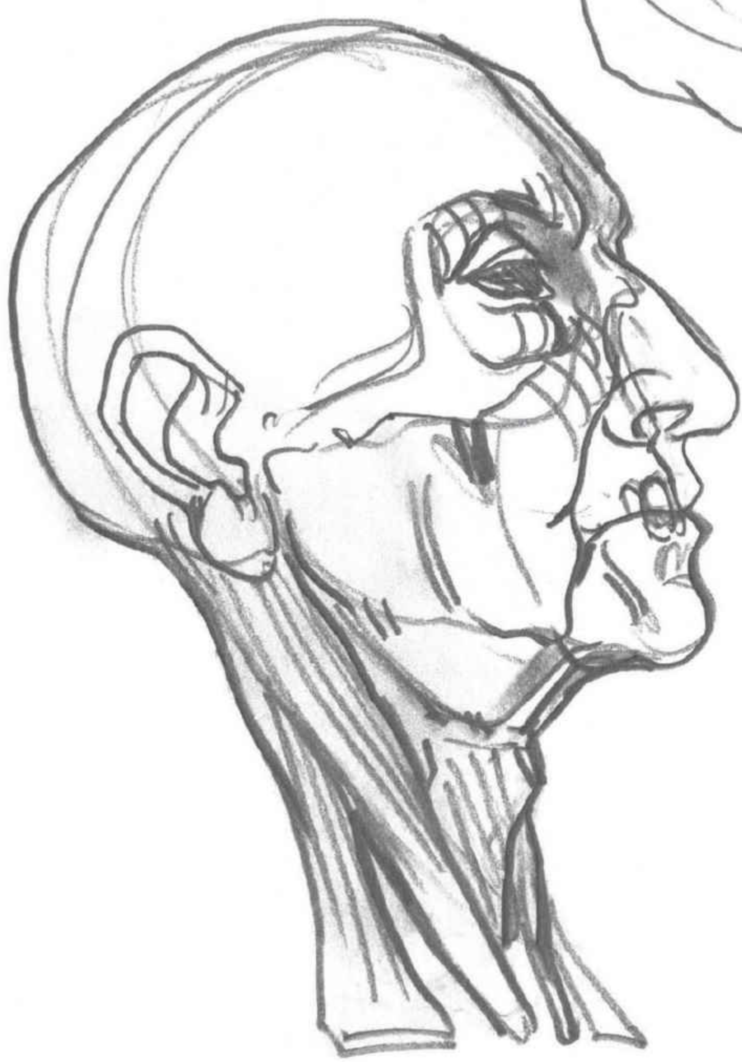


Fig. 2: *The cartilage is shaded. On the other drawings, the contours and volume of the skin have been added.*









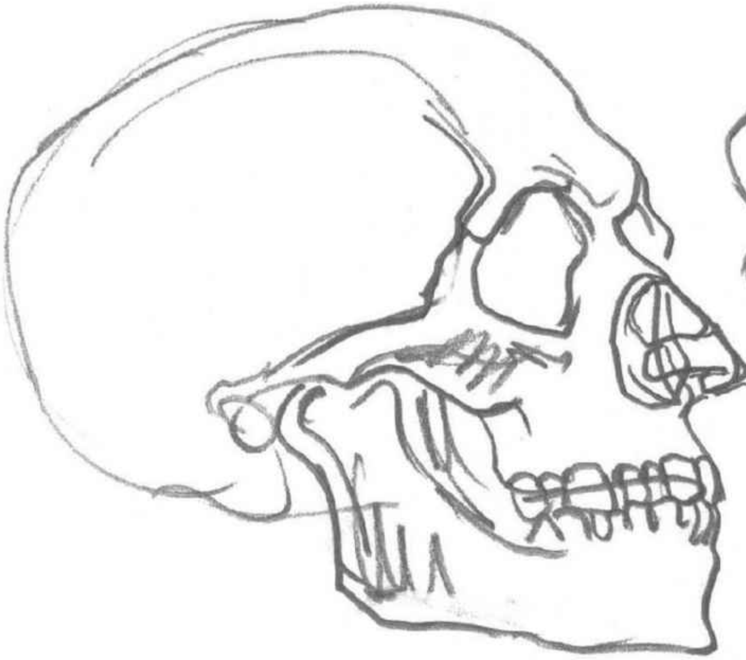


Fig. 1

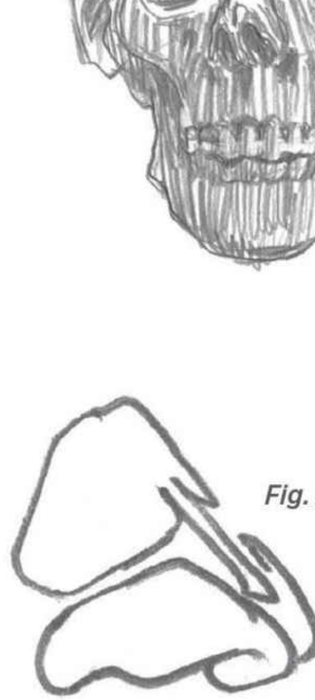


Fig. 2

Nose cartilage:
Fig. 1: *In profile*.
Fig. 2: *Angled (three-quarters) view*.

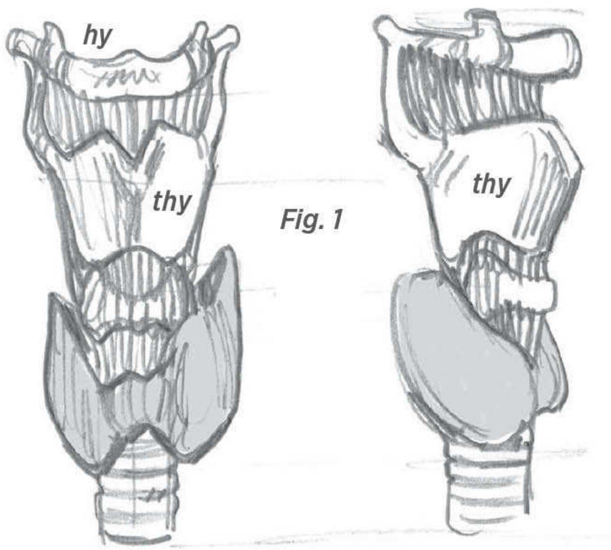


Fig. 1: *Larynx; frontal and profile. Thyroid gland (shaded zone)*.

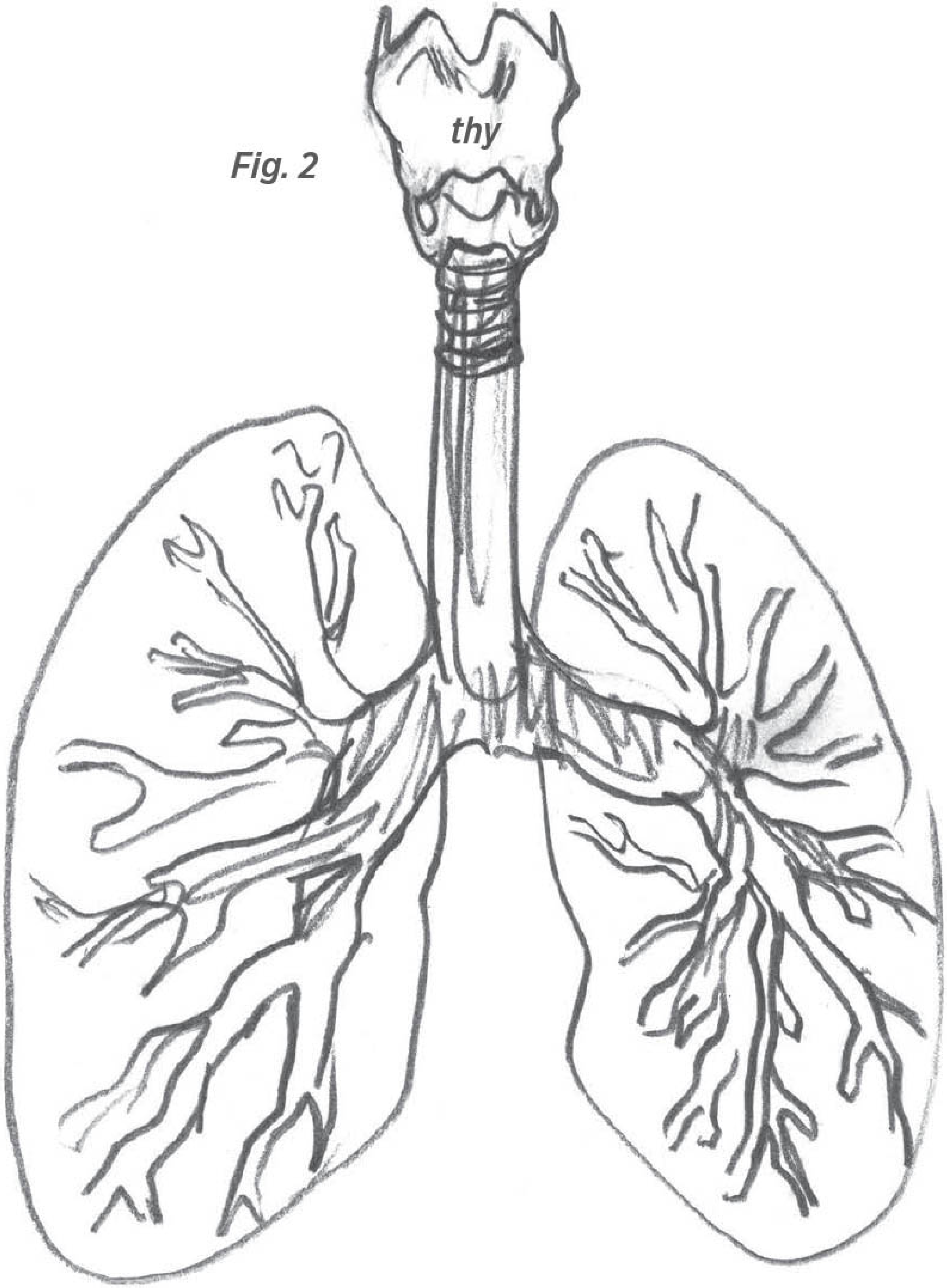


Fig. 2

Fig. 2: *Larynx, trachea, and lungs*.

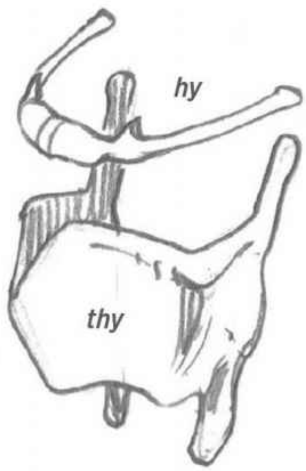


Fig. 3

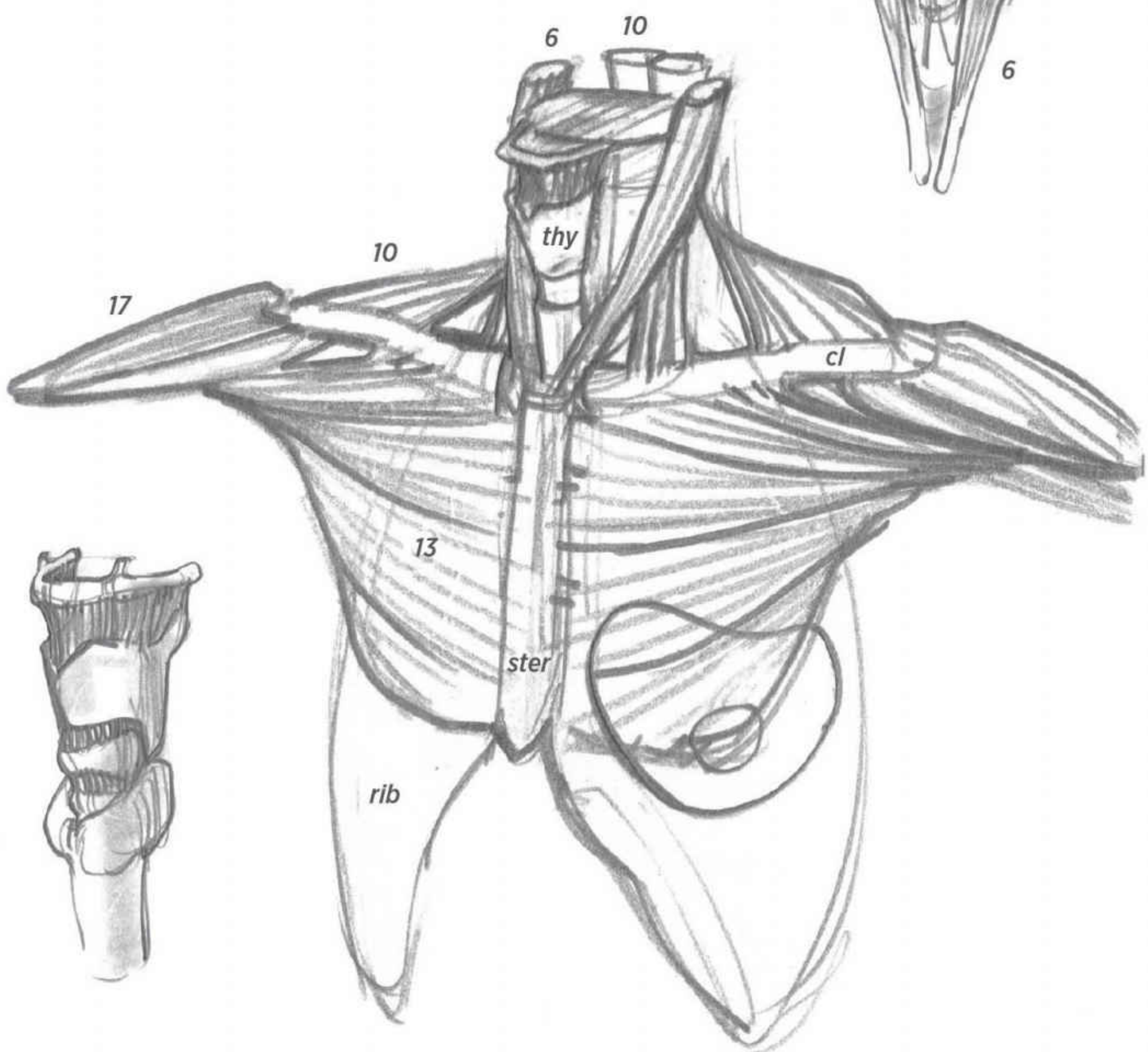


Fig. 3: *Hyoid bone (hy) and thyroid cartilage (thy).*

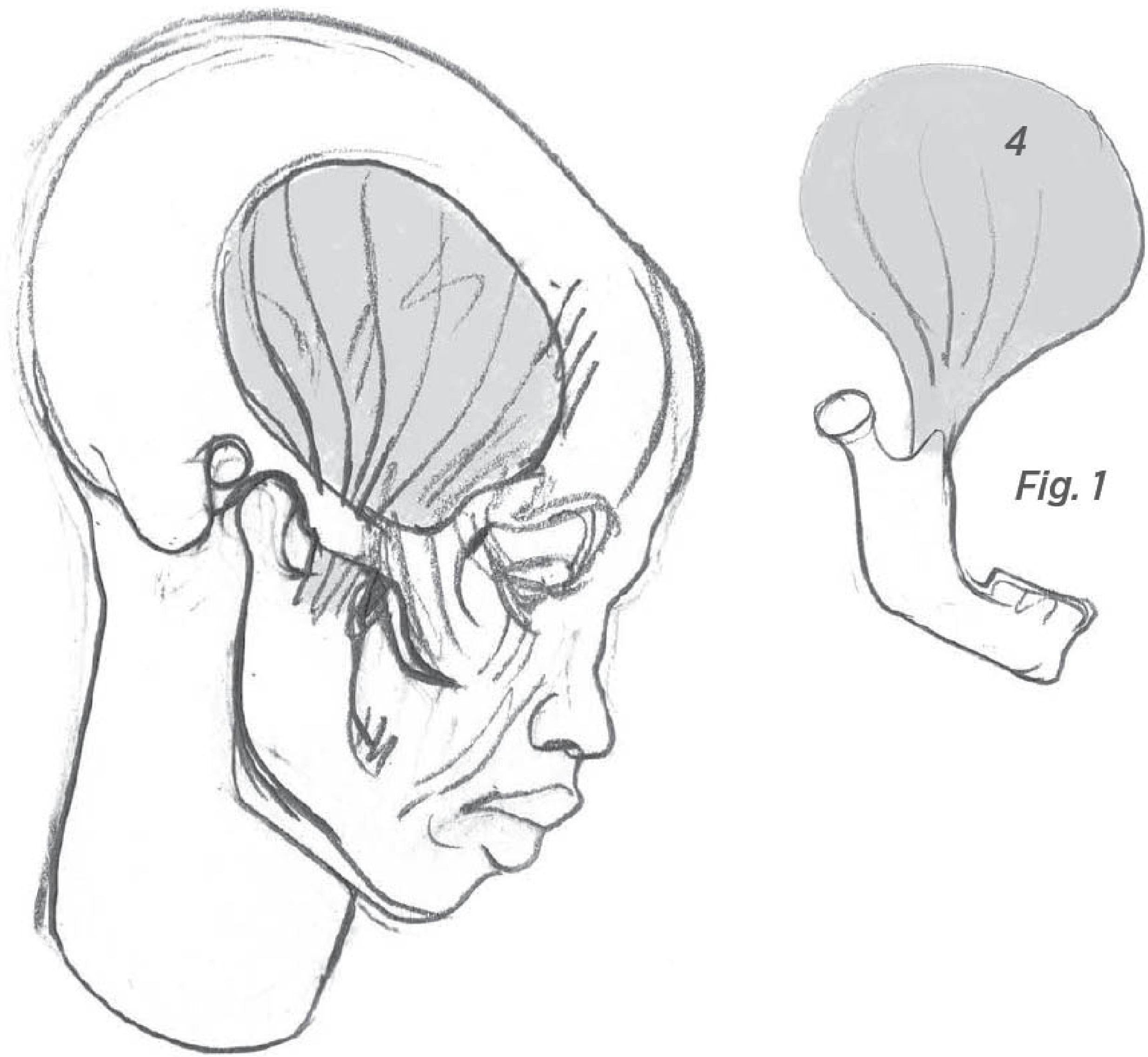


Fig. 1: *Insertion of the temporal muscle (4) into the inferior maxillary (lower jaw).*


5

On the skull seen in profile, a bony arch (the zygomatic arch) makes it possible for two masticatory muscles to be superimposed: the temporal muscle (4) slides underneath and the masseter muscle (5) is inserted above.


4
6
7
6
10

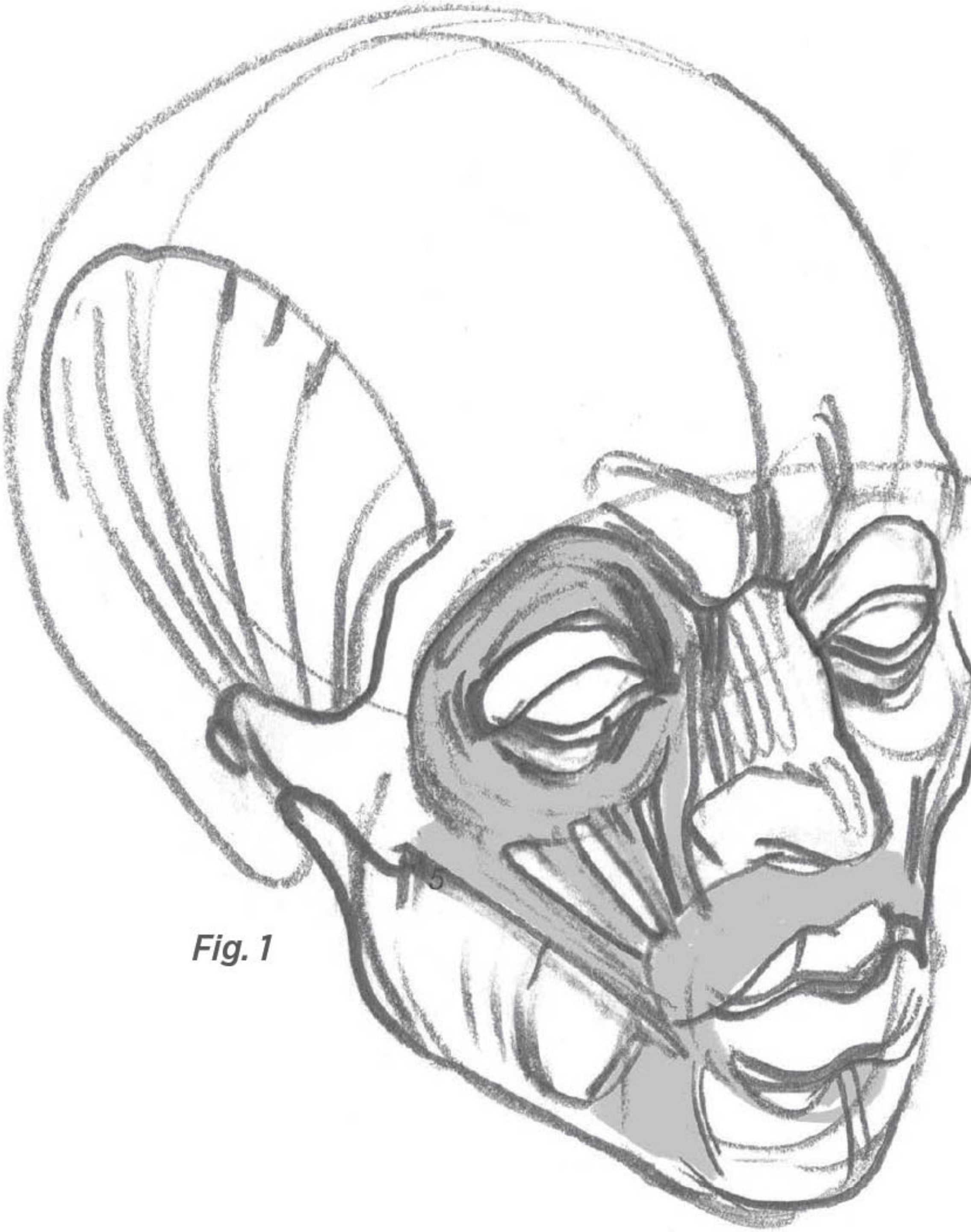


Fig. 1

Fig. 1: *Muscles radiating around the corners of the lips. These muscles allow for the opening of the mouth in all directions.*

Fig. 2

Fig. 2: *Bony mask. The muscles are not shown on this drawing.*

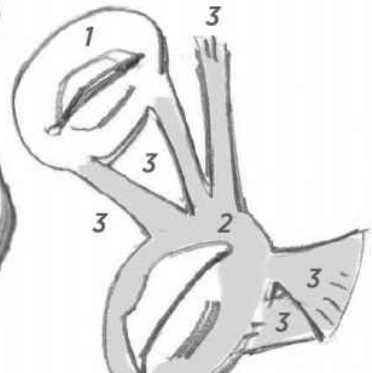


Fig. 3

Fig. 3: *System radiating from the muscles of the mouth. These are "skin muscles." They merge with the skin, and when they contract, they create folds (or wrinkles) perpendicular to their direction*.

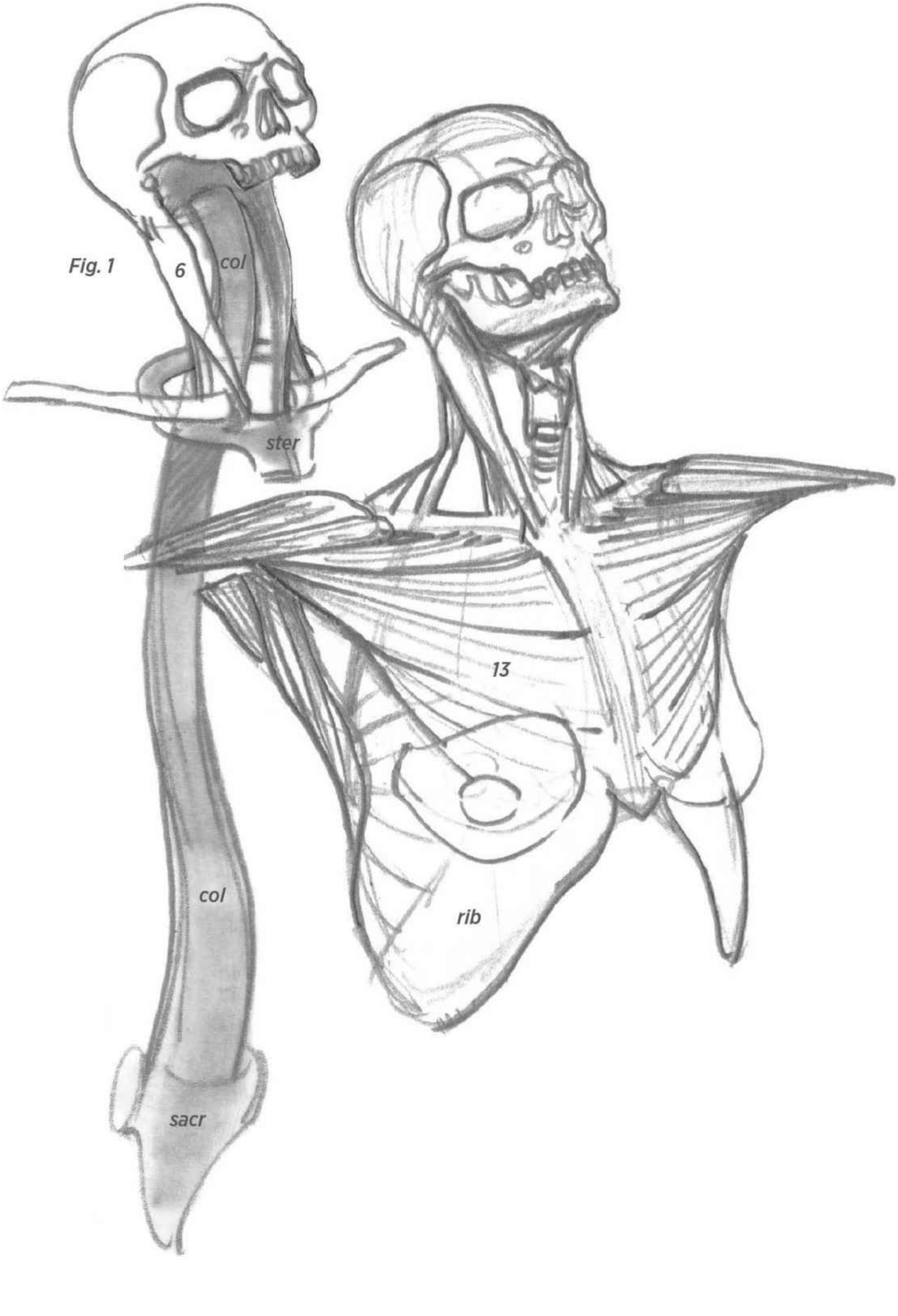


Fig. 1

Fig. 1: *Here, the inferior maxillary has been removed.*

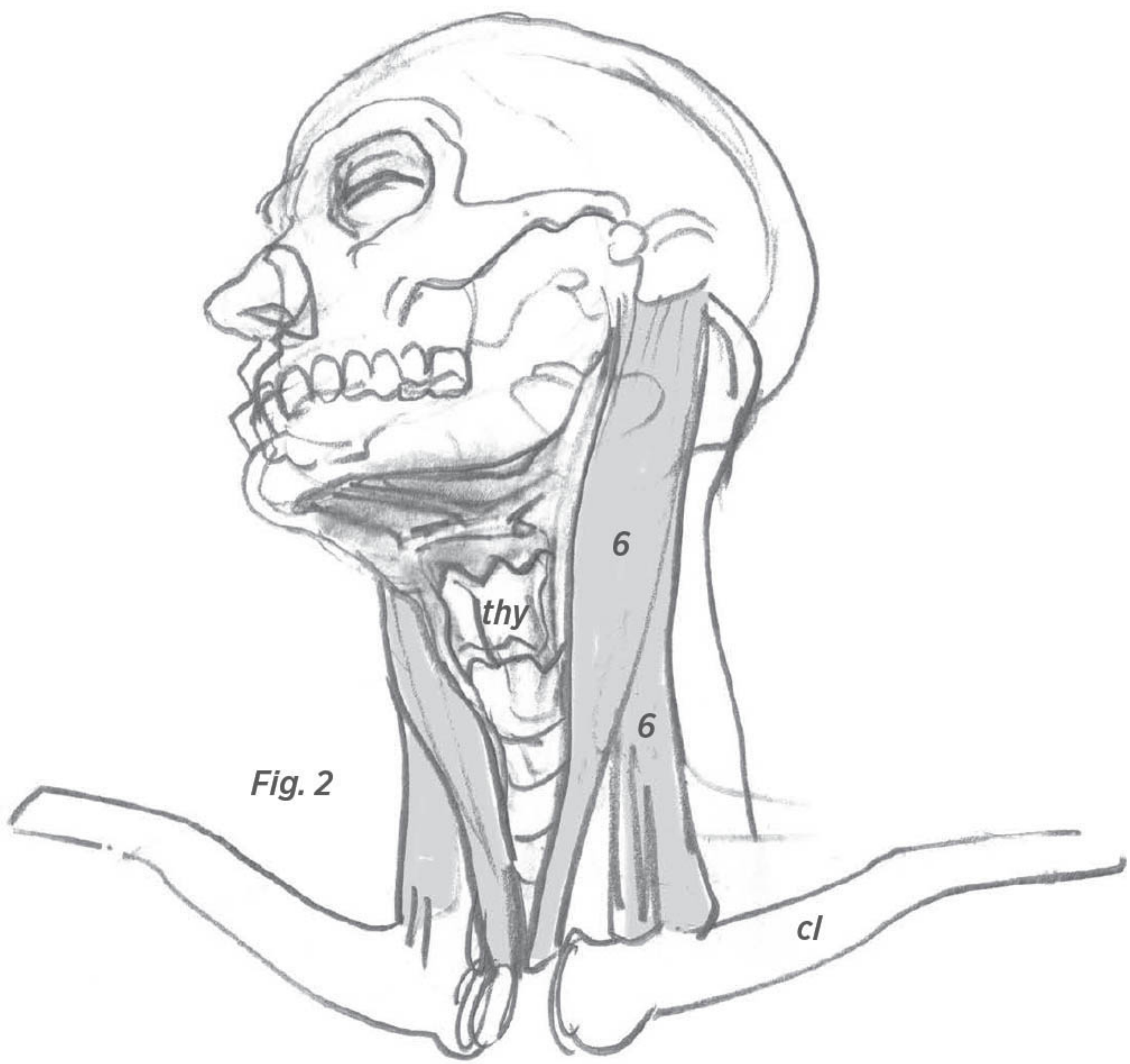


Fig. 2: *Sternocleidomastoid muscle (6), made up of two bundles.*

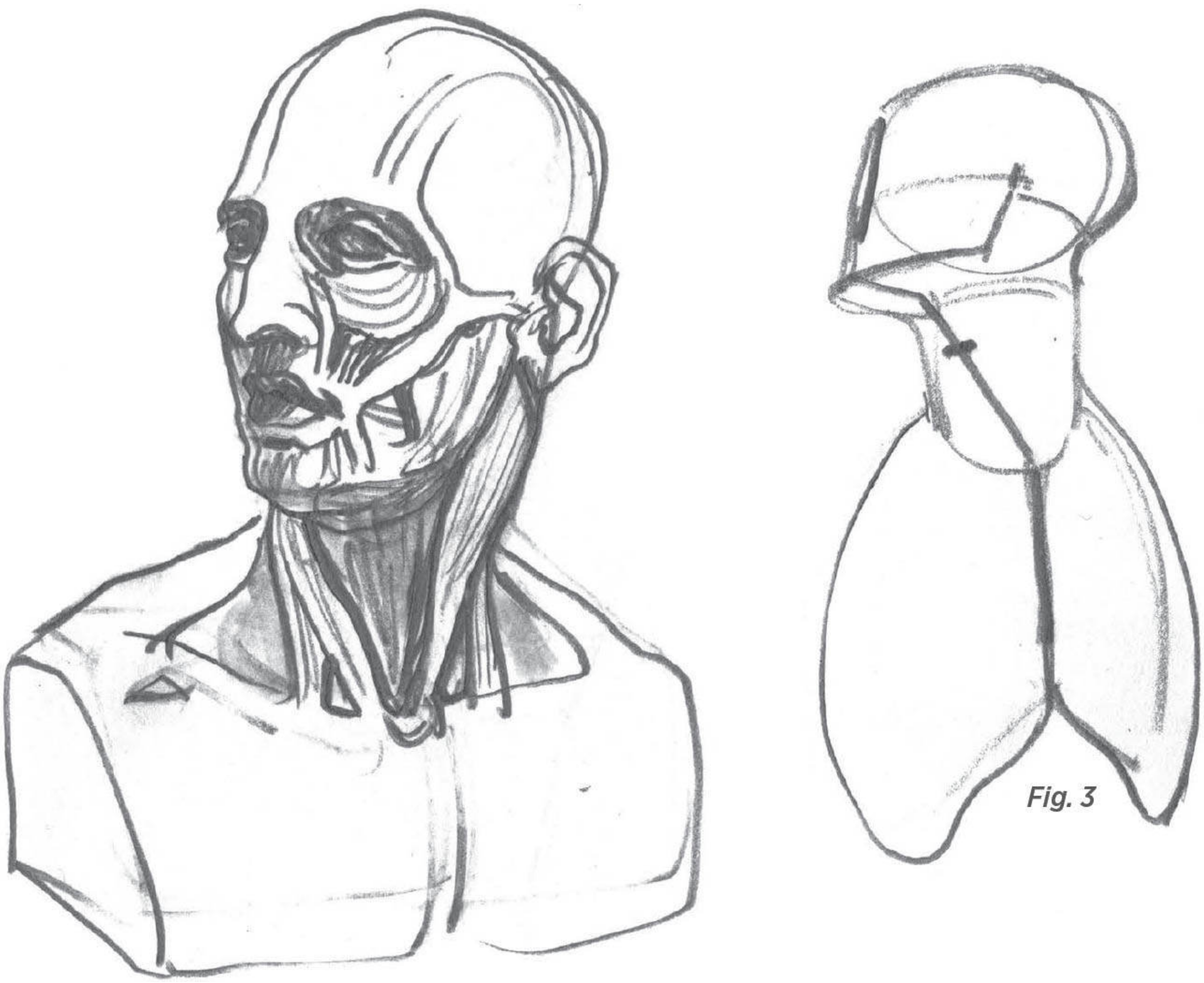
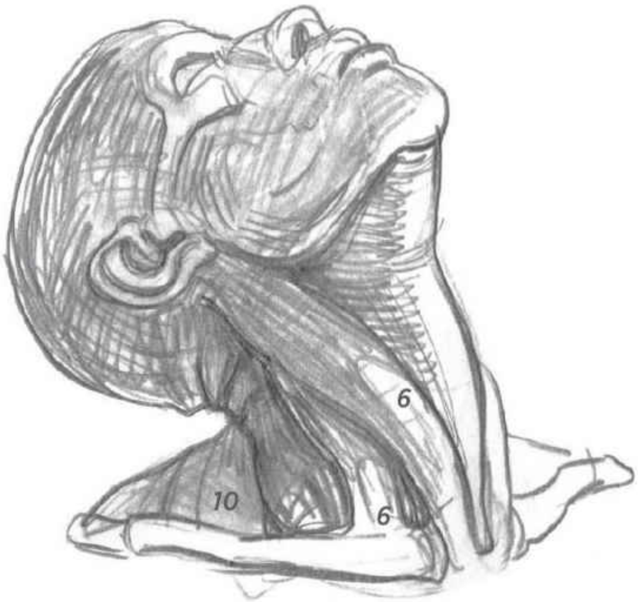
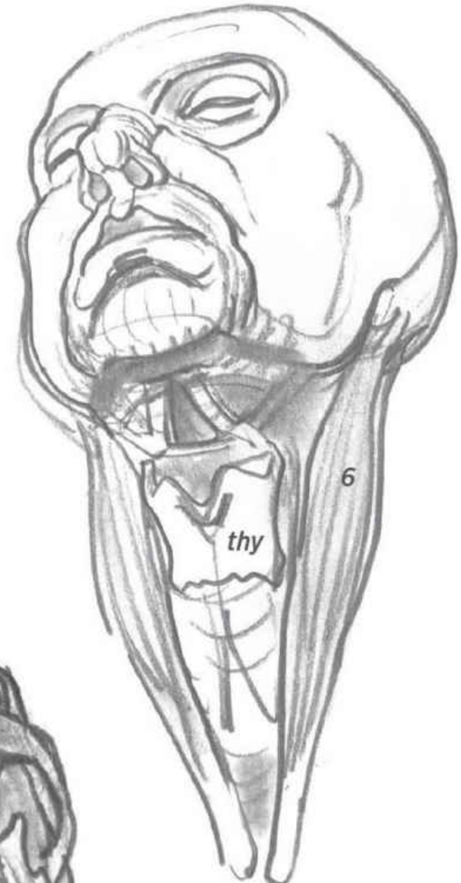
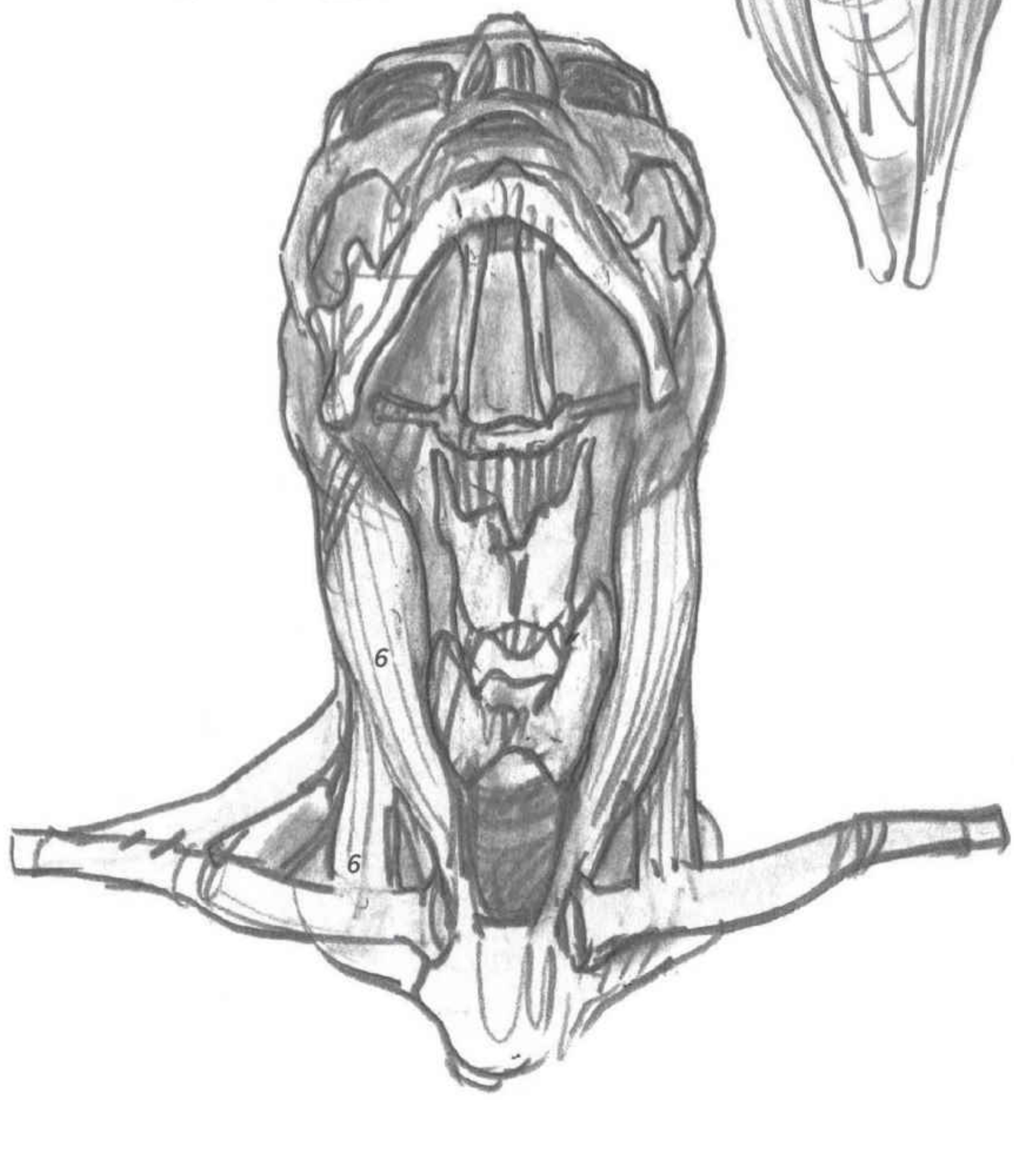


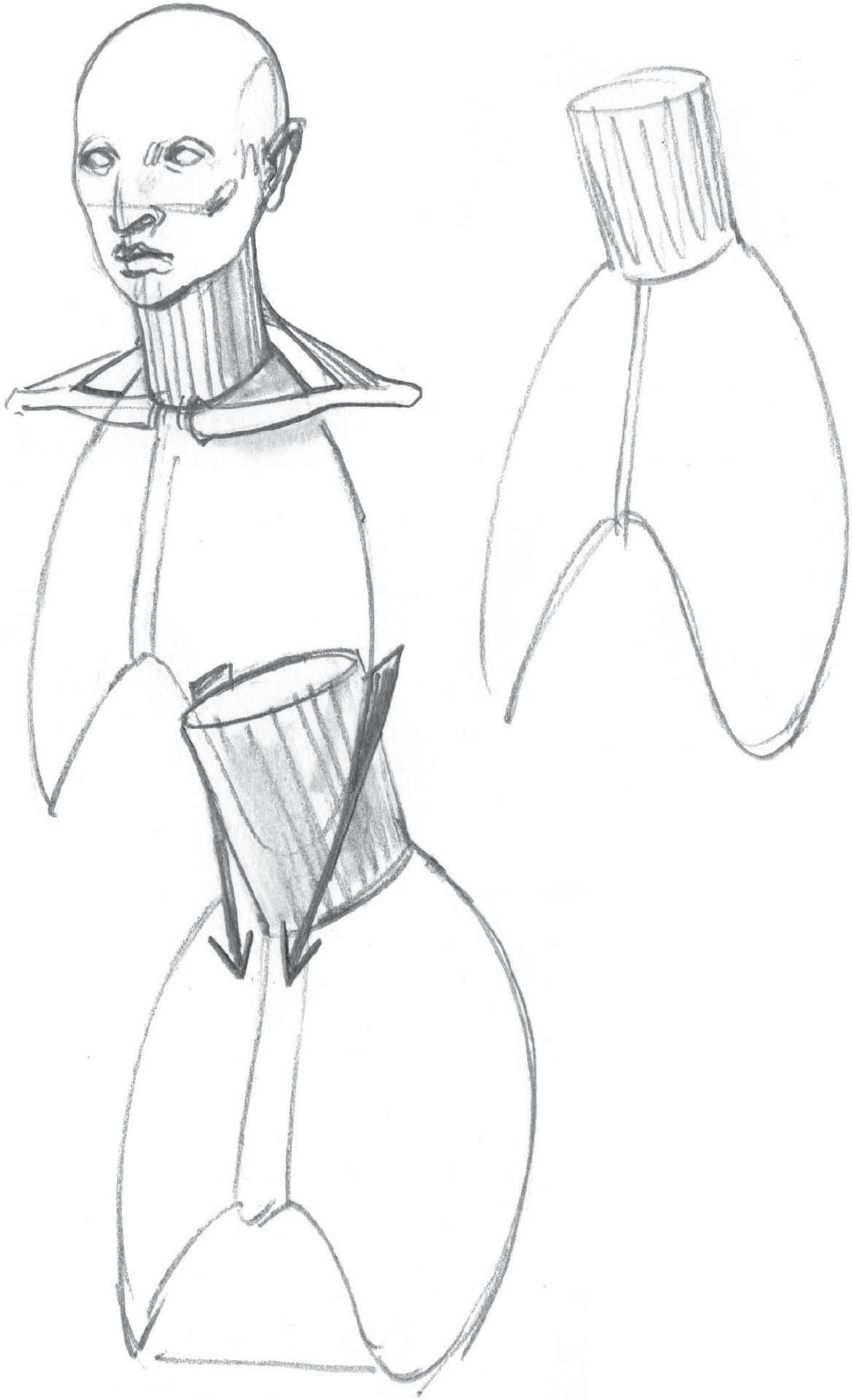
Fig. 3: *The larynx is found on an intermediate axis between the head and the sternum, show here during rotation*.


6
10
6


6
thy


6
6

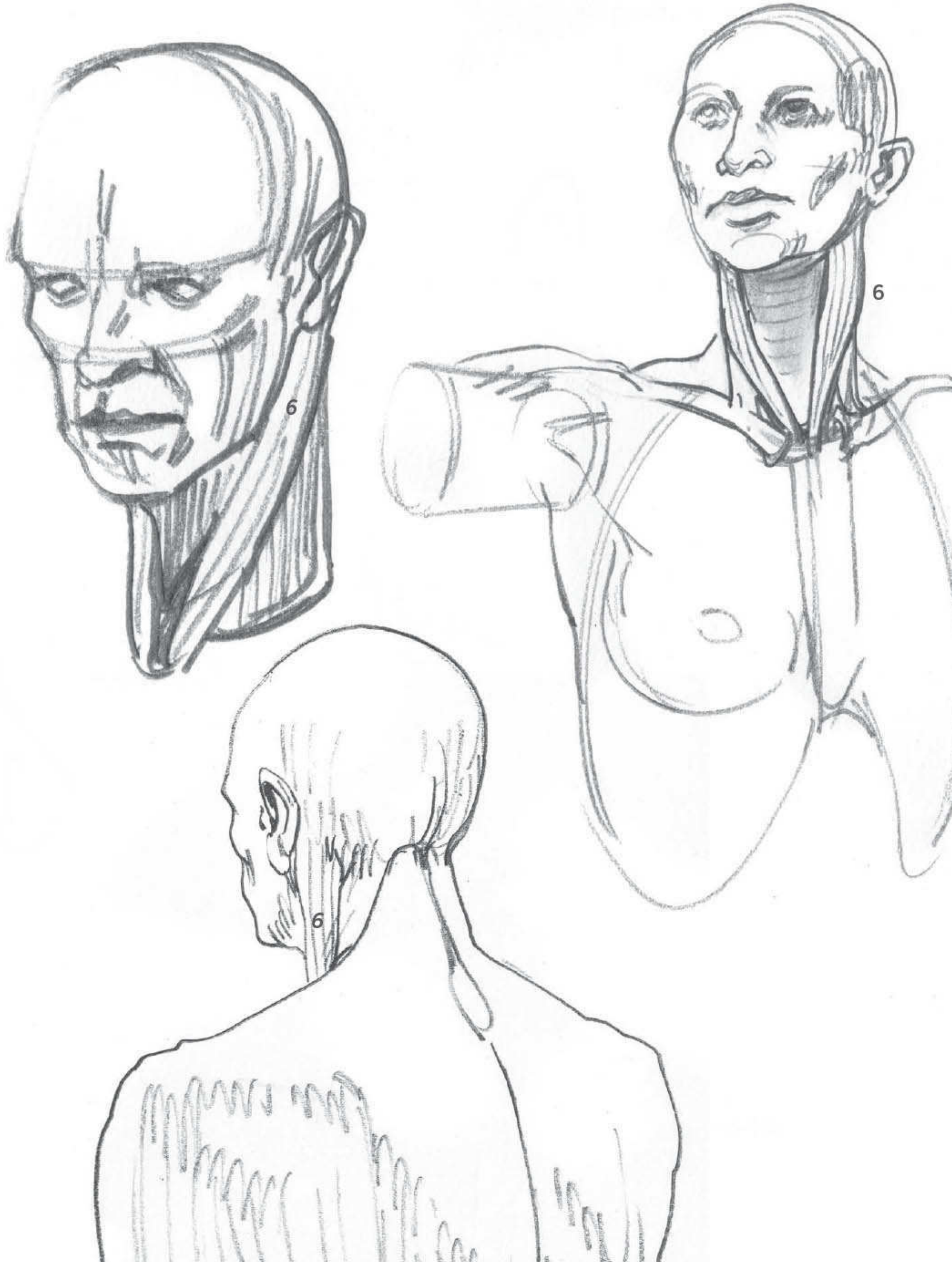

17
21
13
19
11
15
9
8



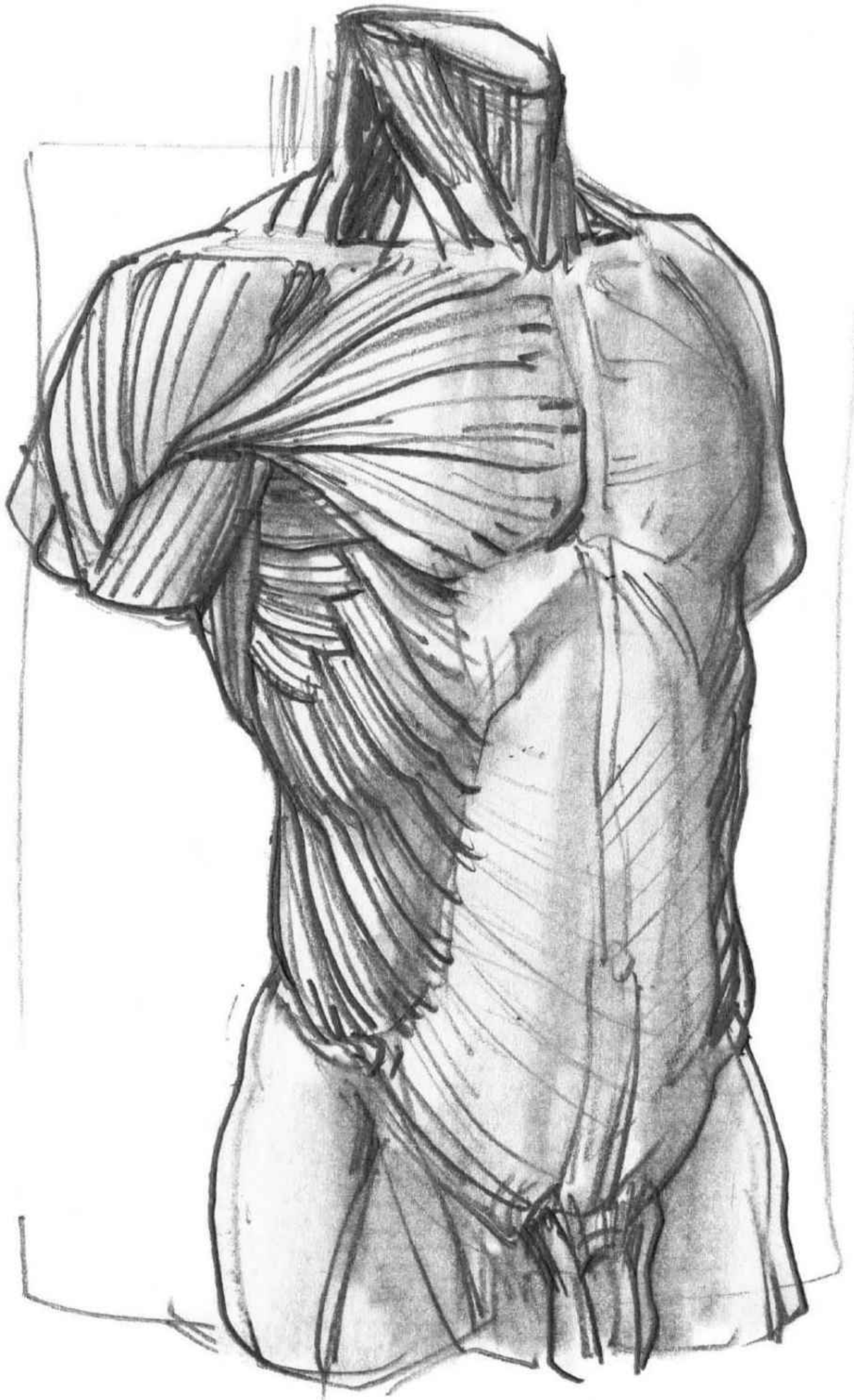
Heads constructed with the support of the axes that connect the bony points of the cheekbones and the brow ridges. Reference points were placed with respect to the eyes, which are positioned at the halfway point of the height of the face.

The placement of the ears is estimated as halfway up on the profile, at the same height as the nose.

The width of the neck coincides relatively well with the circumference of the opening of the rib cage, at the level of the first rib.


6
6
6

The sternocleidomastoids (6) are molded around the tube formed by the neck. The contours of the neck sit on the shoulders like a shawl, descending as they move from back to front.



torso

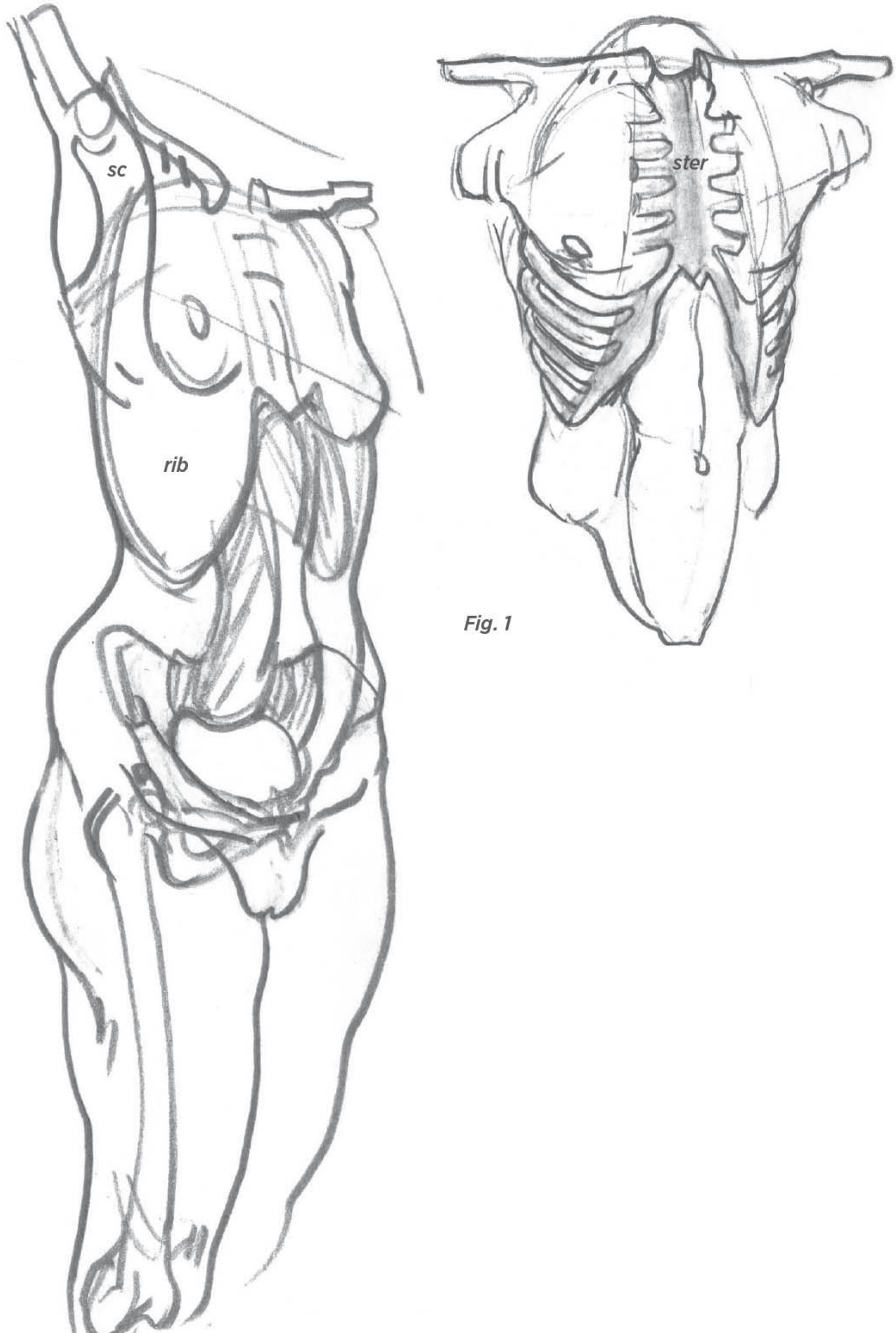


Fig. 1

Fig. 1: *Bony version of the torso: the rib cage is the dominant feature, and its lower boundary is fully visible down to the point of the sternum (ster).*

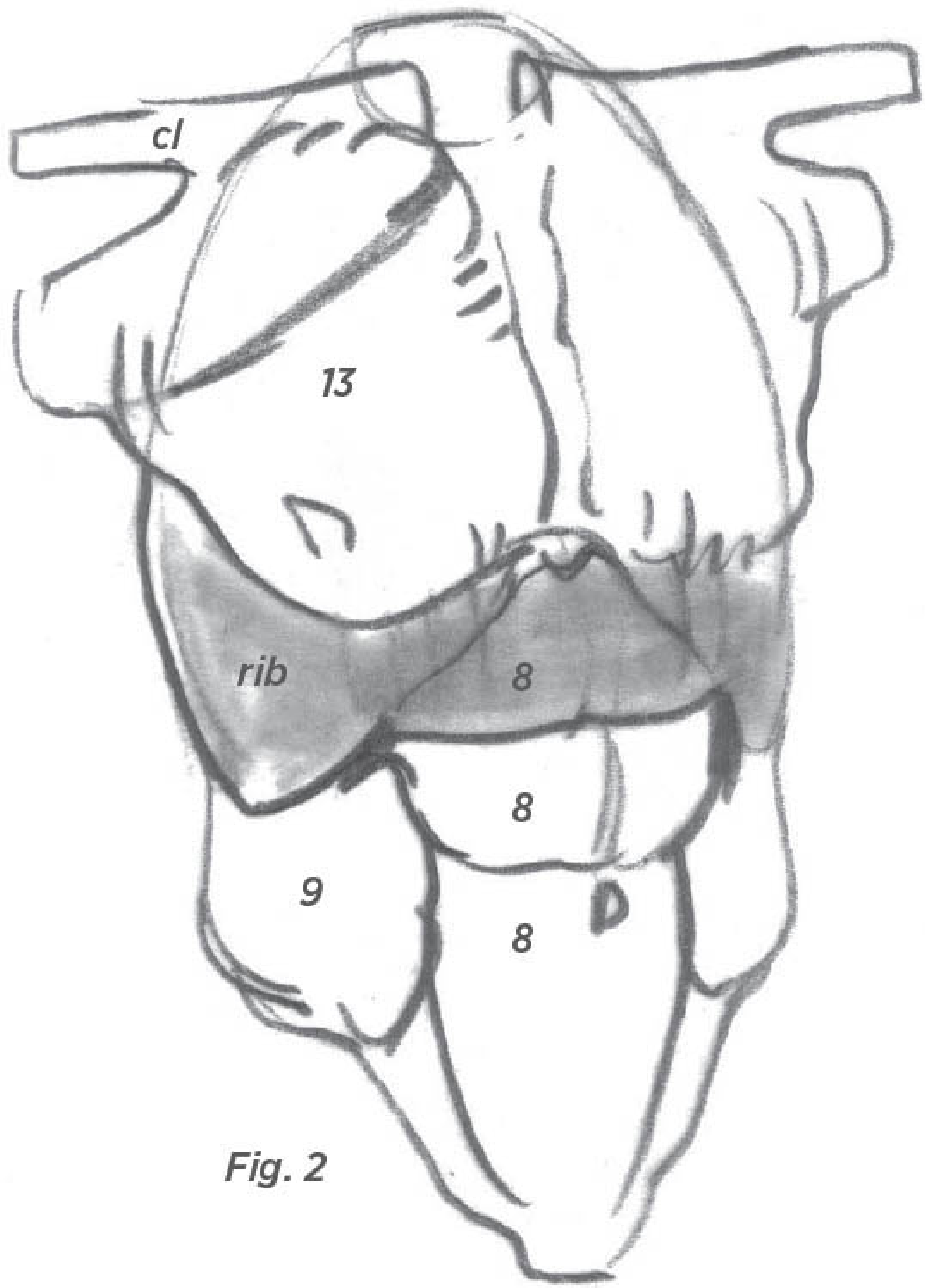


Fig. 2

Fig. 2: *Muscular version of the torso: the pectorals (13) hide the outline of the ribs and cartilage, while the rectus abdominis muscles (8) occupy a part of the more open angle described by the lower boundary of the rib cage. The rib cage (rib) and rectus abdominis muscles converge on the same plane underneath the pectorals (shaded zone).*

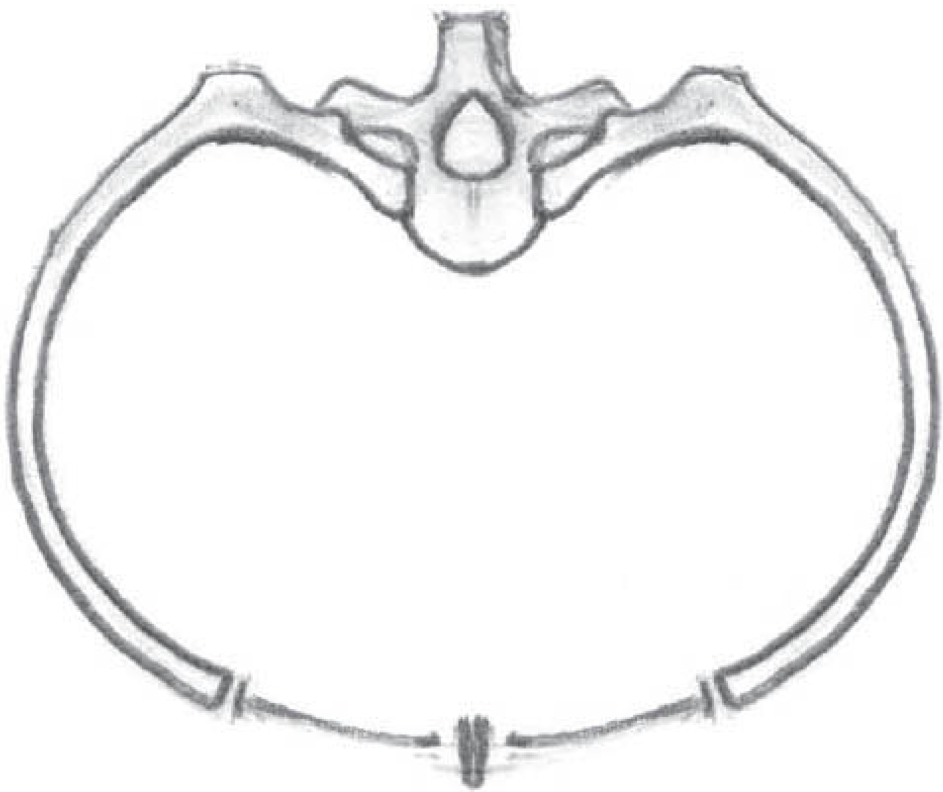


Fig. 3

Fig. 3: *Cross-section of the rib cage, halfway up.*

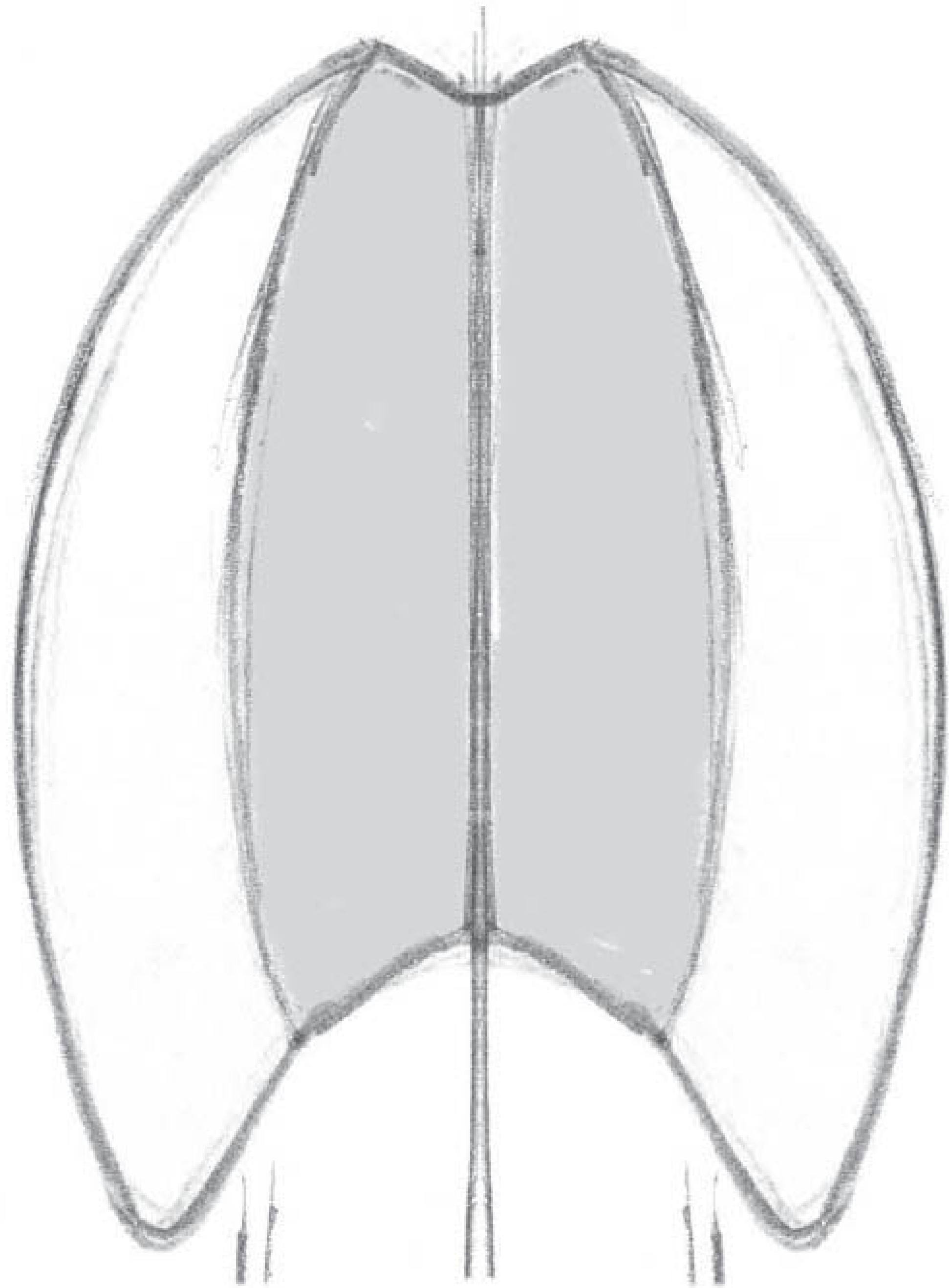


Fig. 4

Fig. 4: *Back view showing channels occupied by the spinal muscles (shaded zone)*.

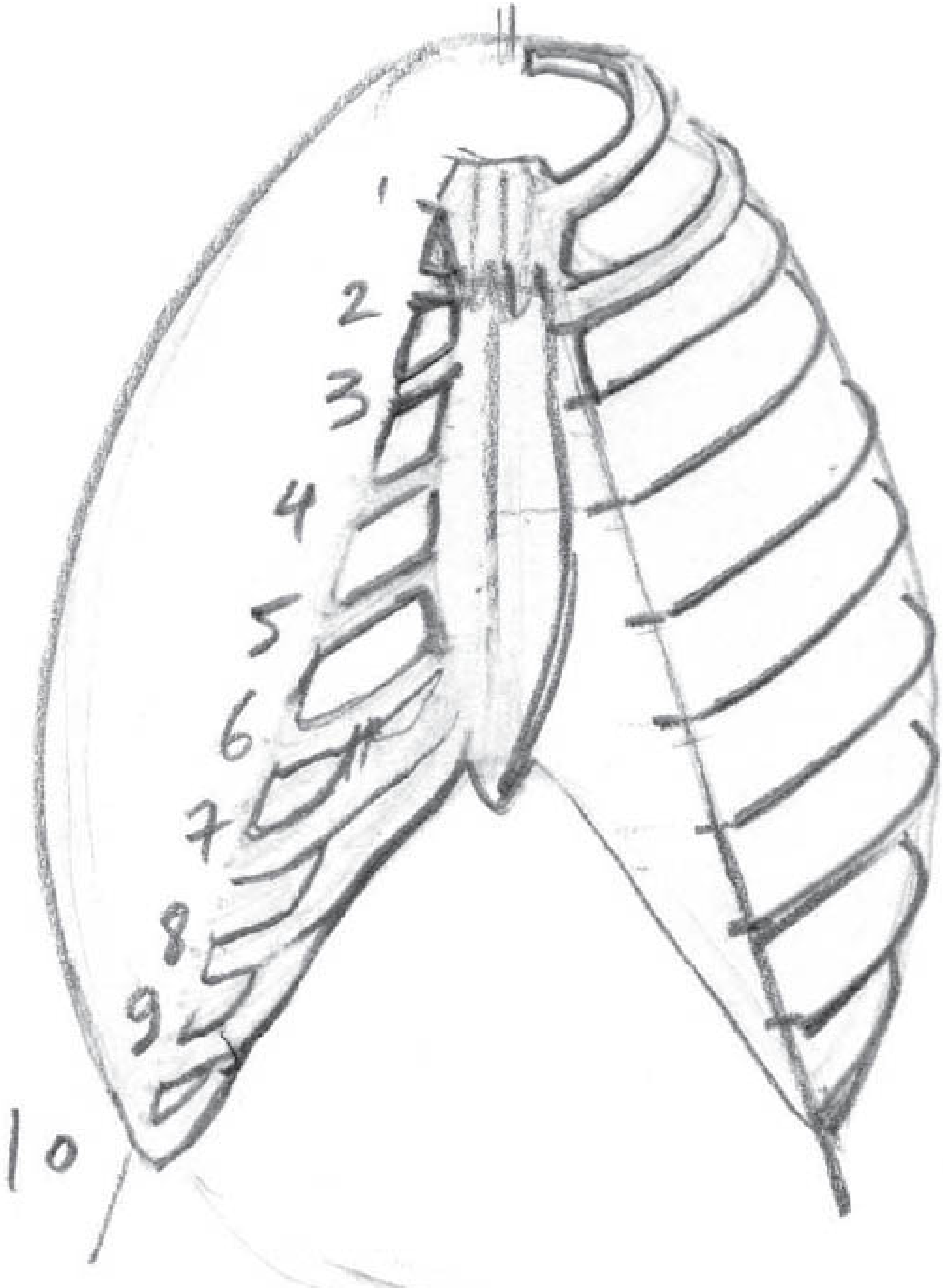


Fig. 5: *Front view showing connections between the first ten ribs and the cartilages.*

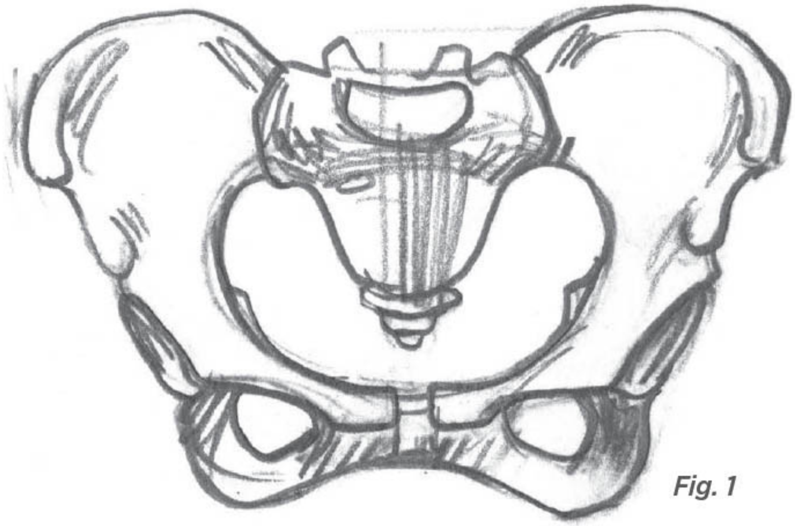


Fig. 1

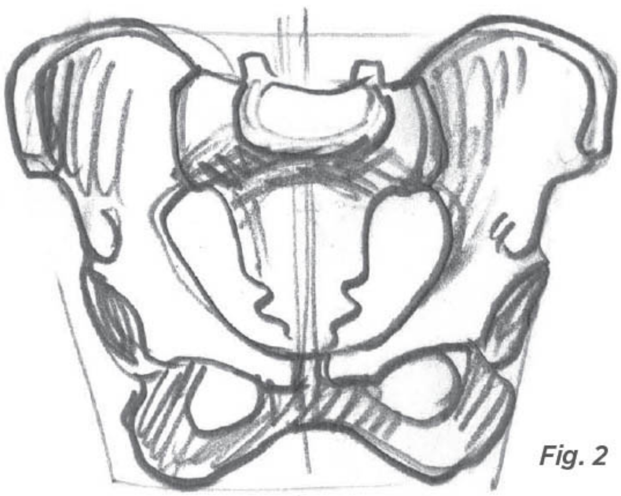
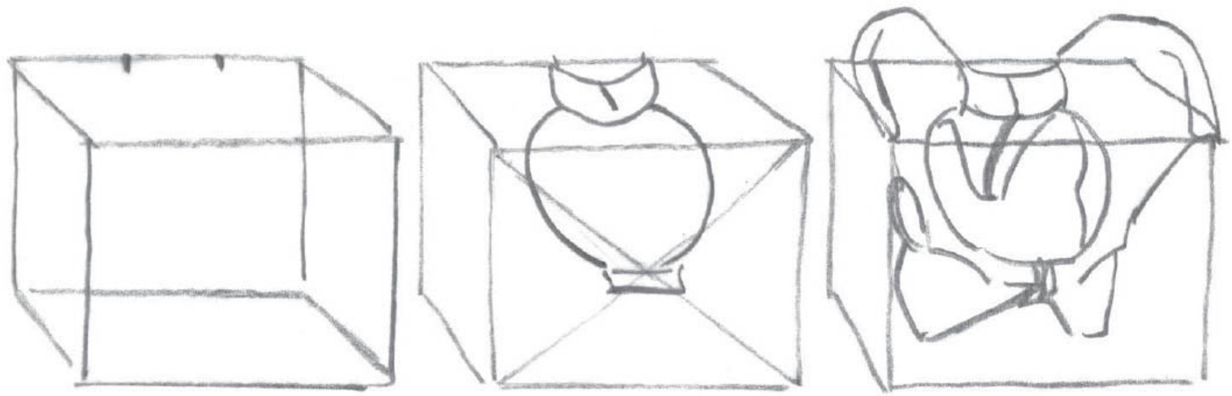
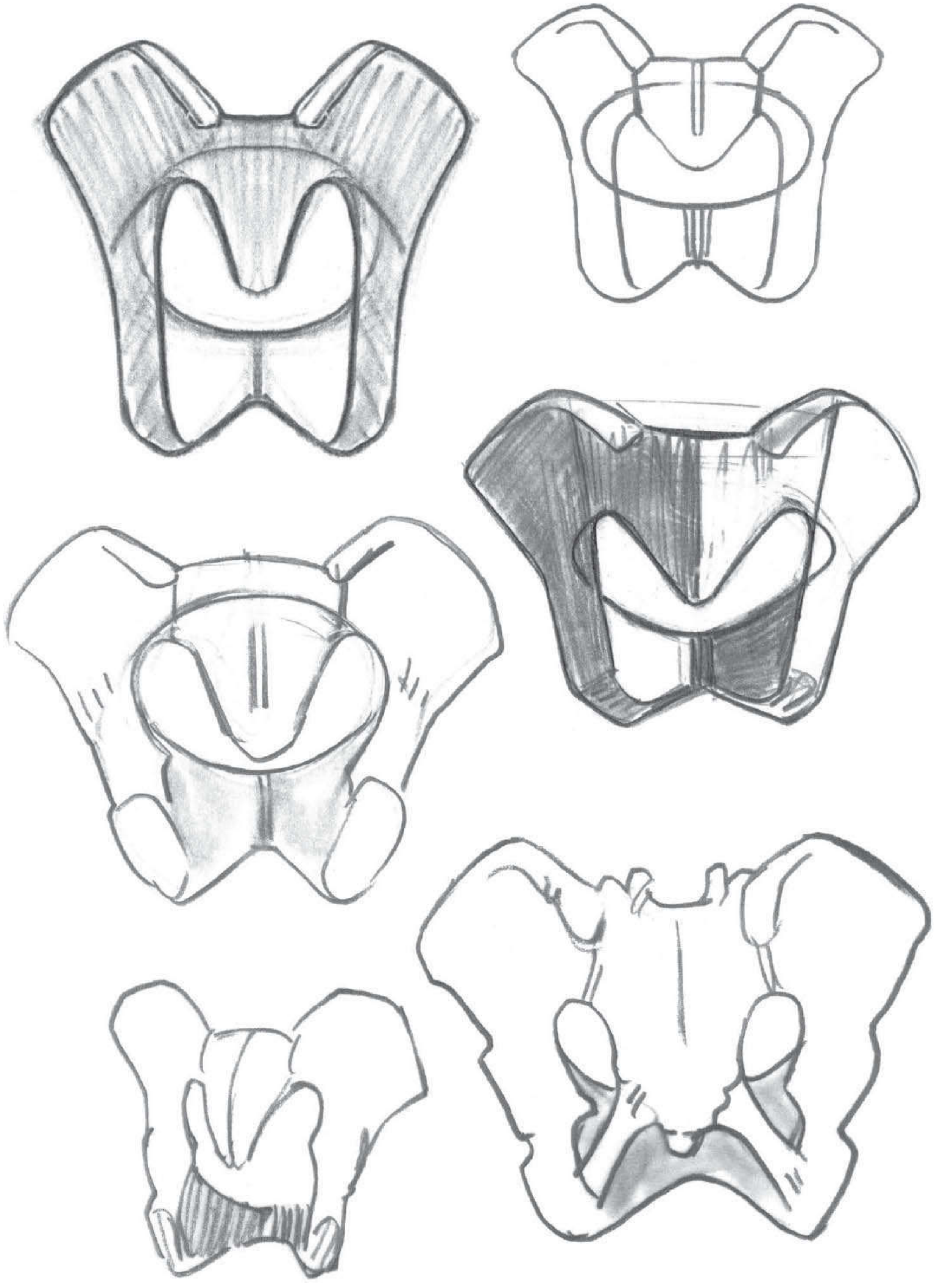


Fig. 2

Pelvises seen from the front (above) and from the back (facing page).
Fig. 1: *Female pelvis.*
Fig. 2: *Male pelvis.*





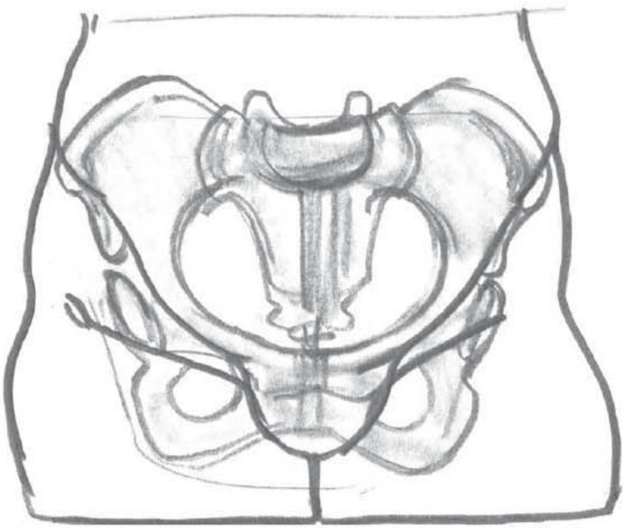


Fig. 1

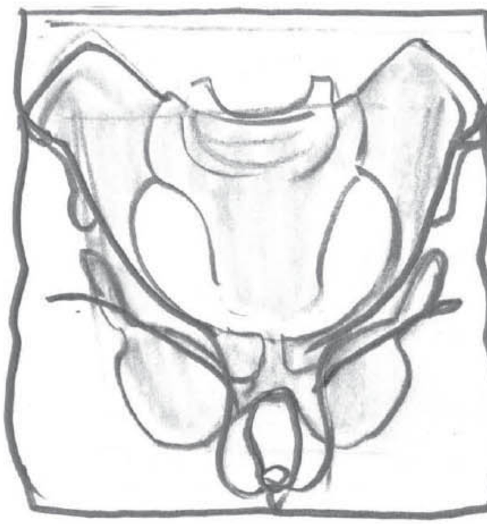


Fig. 2

Fig. 3

Fig. 4

Figs. 1 and 3: *Female pelvises.*
Figs. 2 and 4: *Male pelvises.*

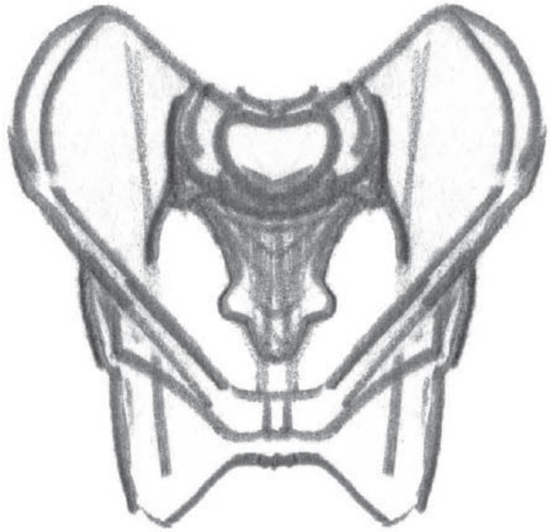


Fig. 5

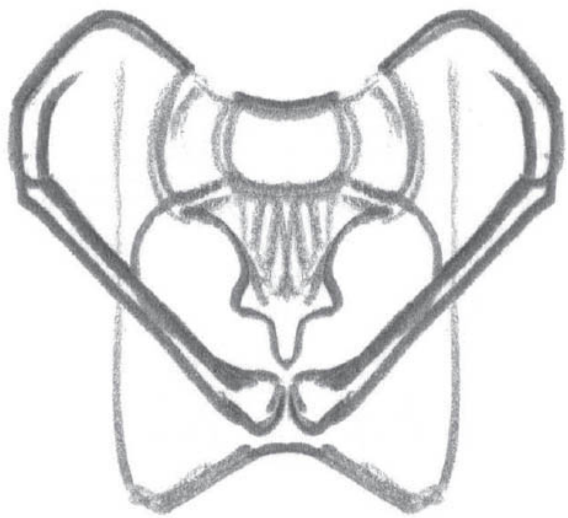
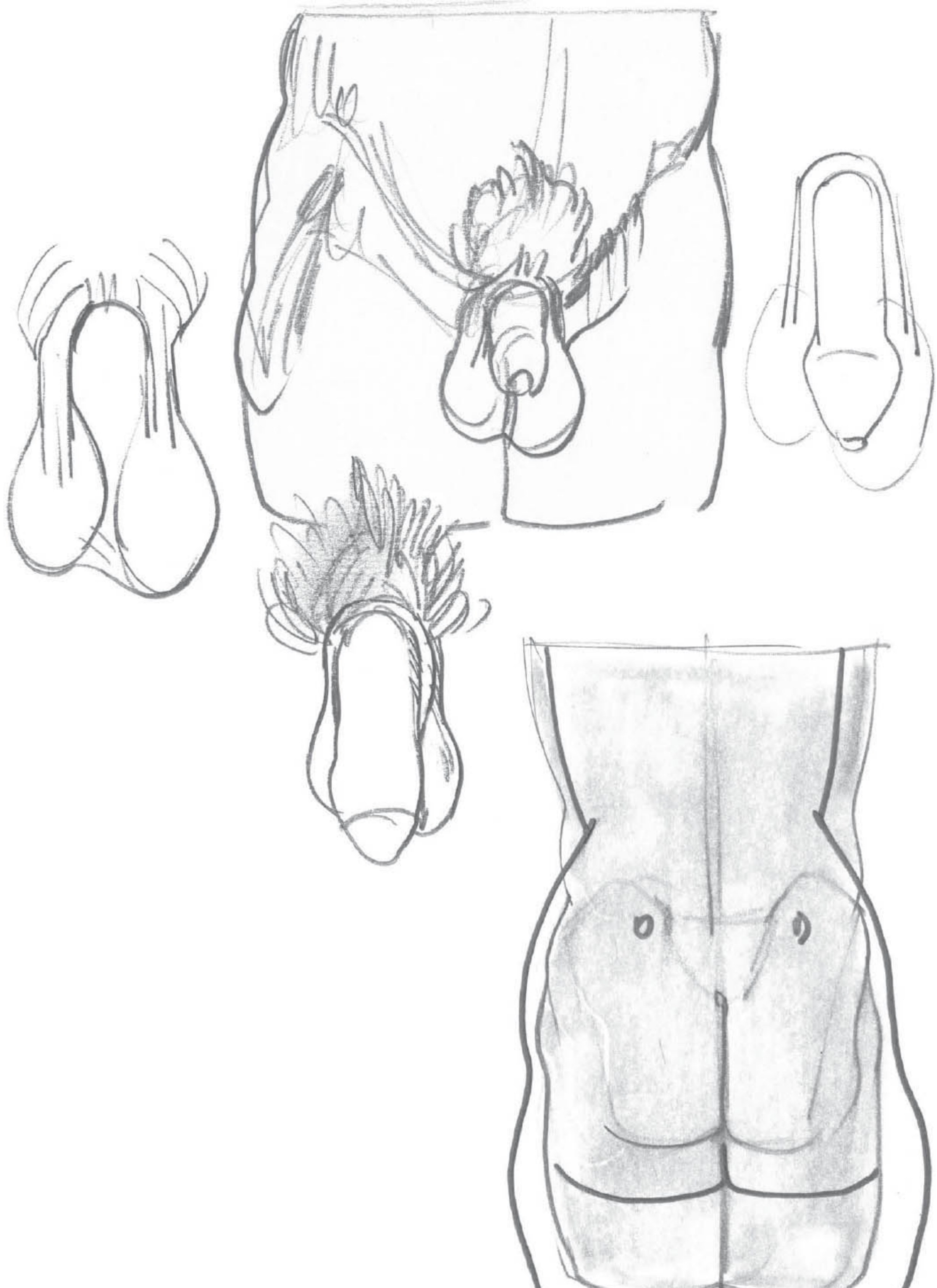


Fig. 5: *A ligament connects the tip of the pelvic wing to the pubis (crural arch, or inguinal ligament)*.


Female

Male



Following Richer, two silhouettes that have been superimposed; one male and one female.


11
8
8
9
33


8

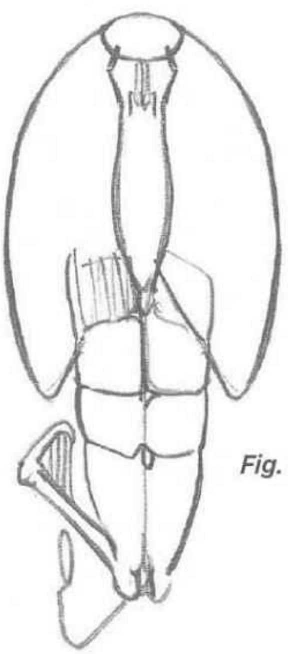


Fig. 1

Fig. 1: *Diagram of the rectus abdominis muscles. The system of tendons creates a grid outline on the front of the abdomen. The lower boundary of the rib cage divides the first square on the diagonal.*

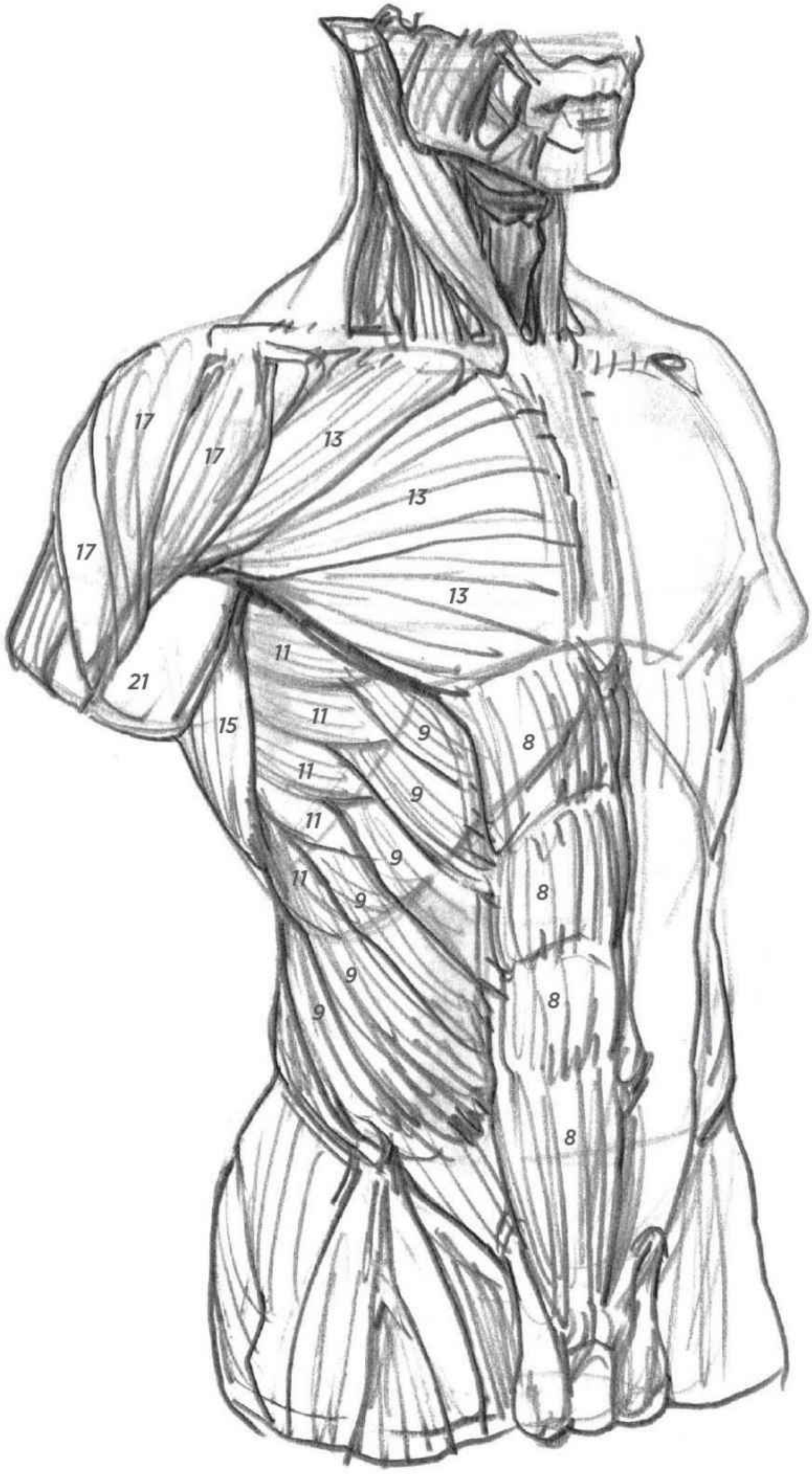

17
17
13
13
17
13
11
21
11
15
9
8
11
9
11
9
11
9
8
9
8
9
8

Fig. 1

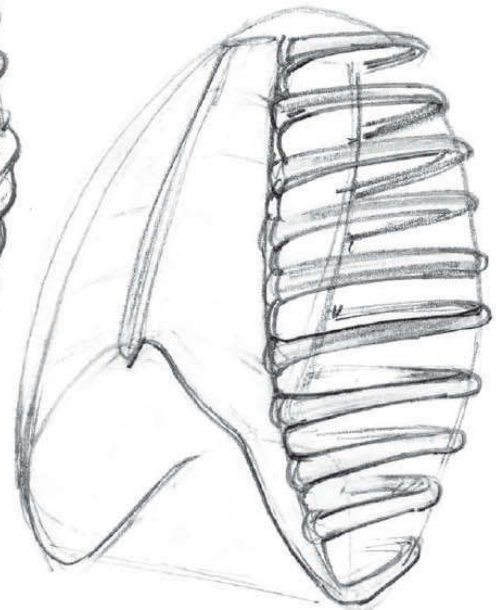


Fig. 1: *Connections among the serratus anteriors (11), large obliques (9), and rectus abdominis muscles (8). All of these muscles are shown only partially so that their insertions into the rib cage are visible*.

Fig. 1

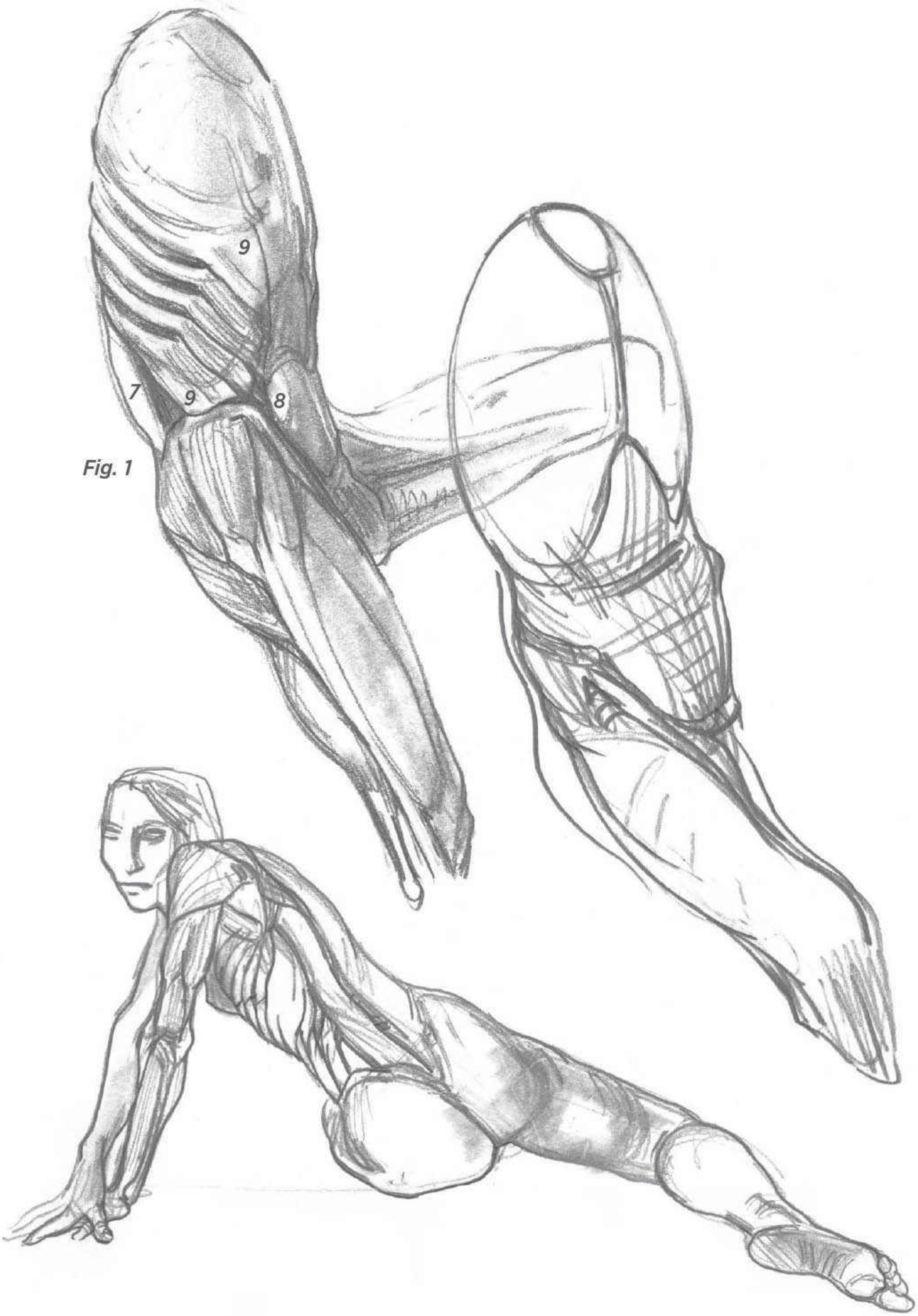


Fig. 1: *Spinal muscles (7), rectus abdominis muscles (8), and obliques (9) form the abdominal belt*.


7
9


7
9

sc
rib
7
10
7
rib
7

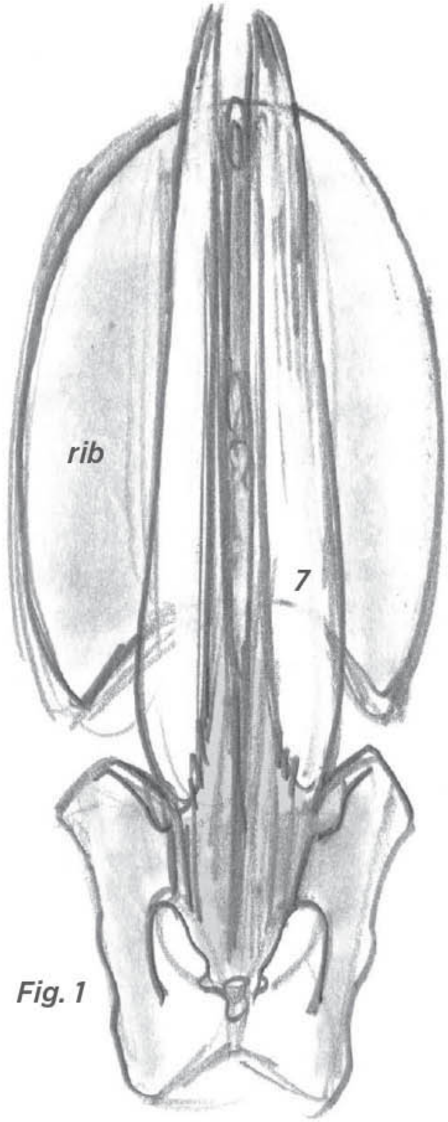


Fig. 1

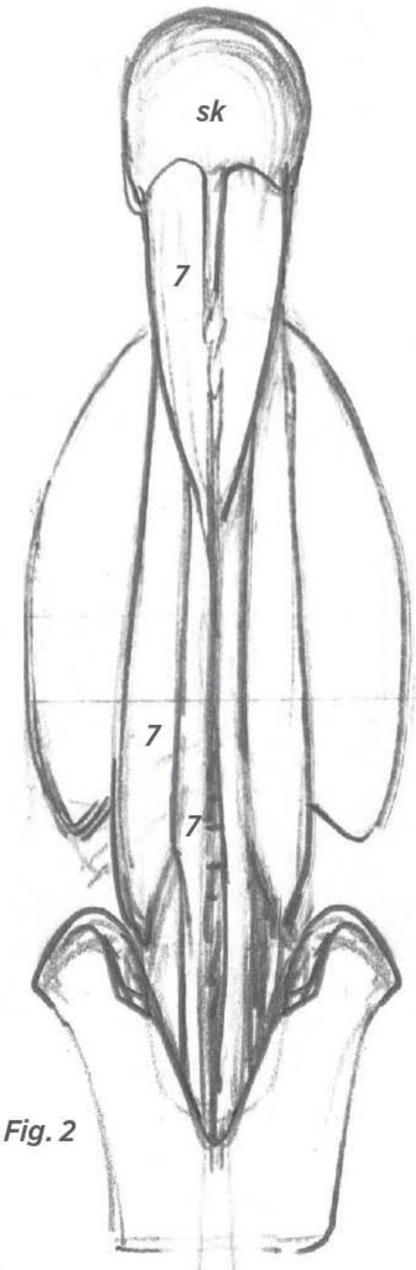


Fig. 2

Fig. 3

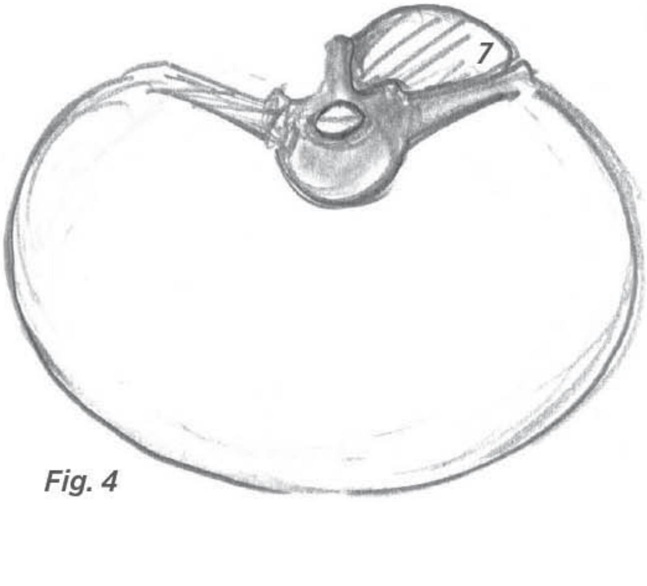


Fig. 4

The extensors of the torso and the head, taken together, form two long muscular bundles called the "spinal muscles."

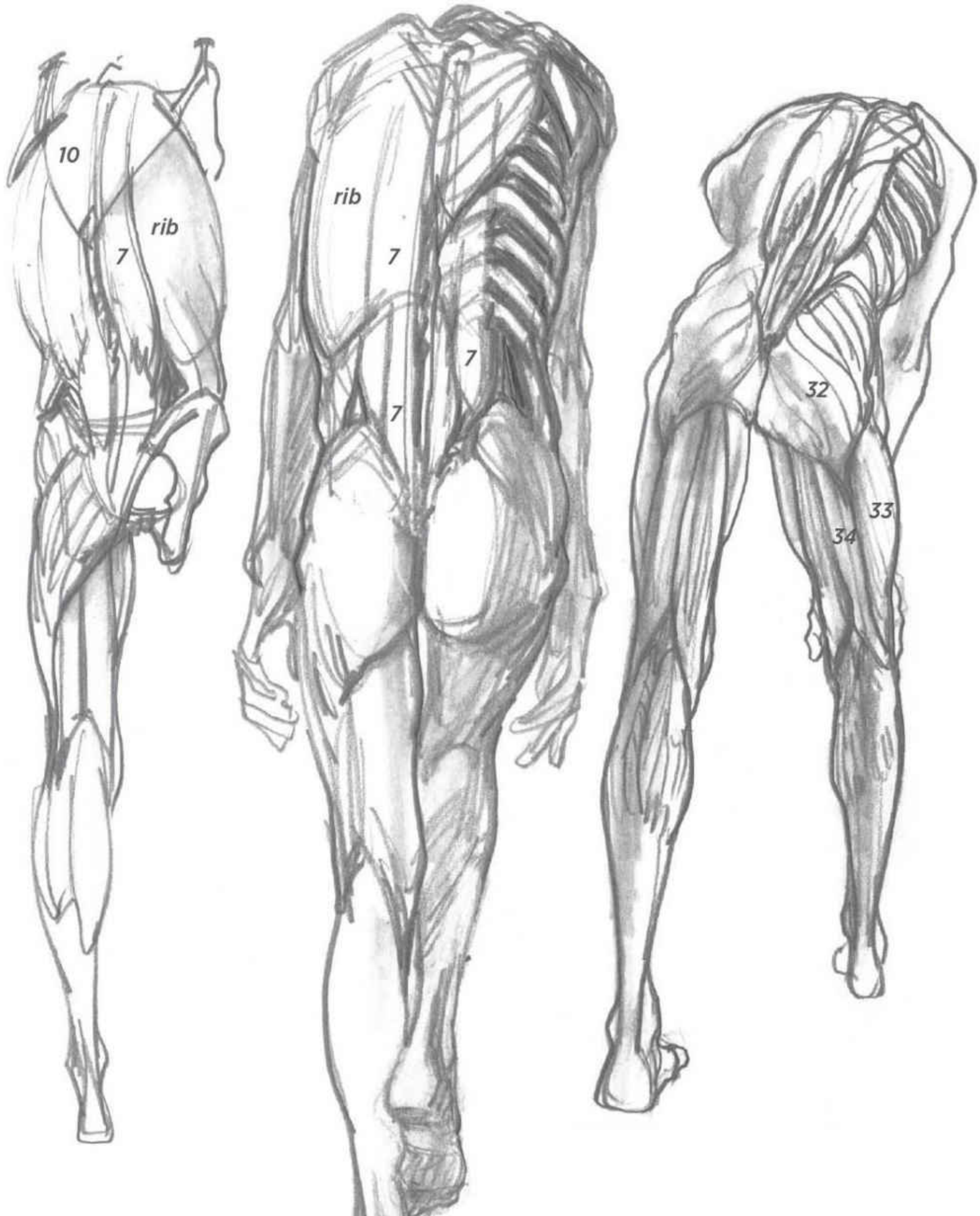
Fig. 1: *Simplified version of the spinal muscles (7). The connection to the head is not shown here*.

Fig. 2: *More detailed version of the spinal muscles, including connections between the extensors of the torso and those of the head*.

Fig. 3: *Three-quarters view from the rear. The shaded zone shows the tendon panel of the spinal muscles, as far as the sacrum*.

Fig. 4: *Cross-section of the rib cage, halfway up*.


10
7
rib
32
33
34

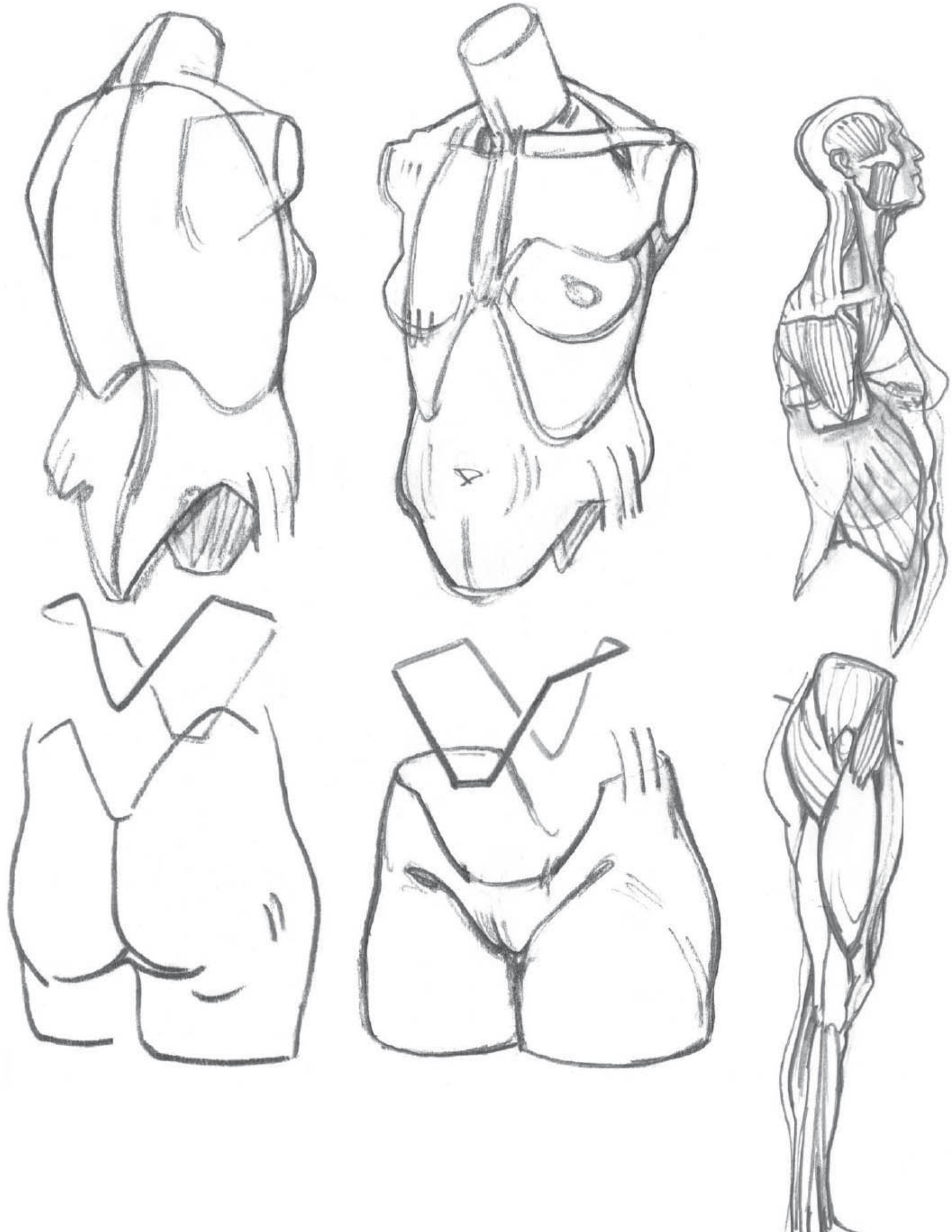

10
rib
7
rib
7
7
7
32
33
34


rib
7

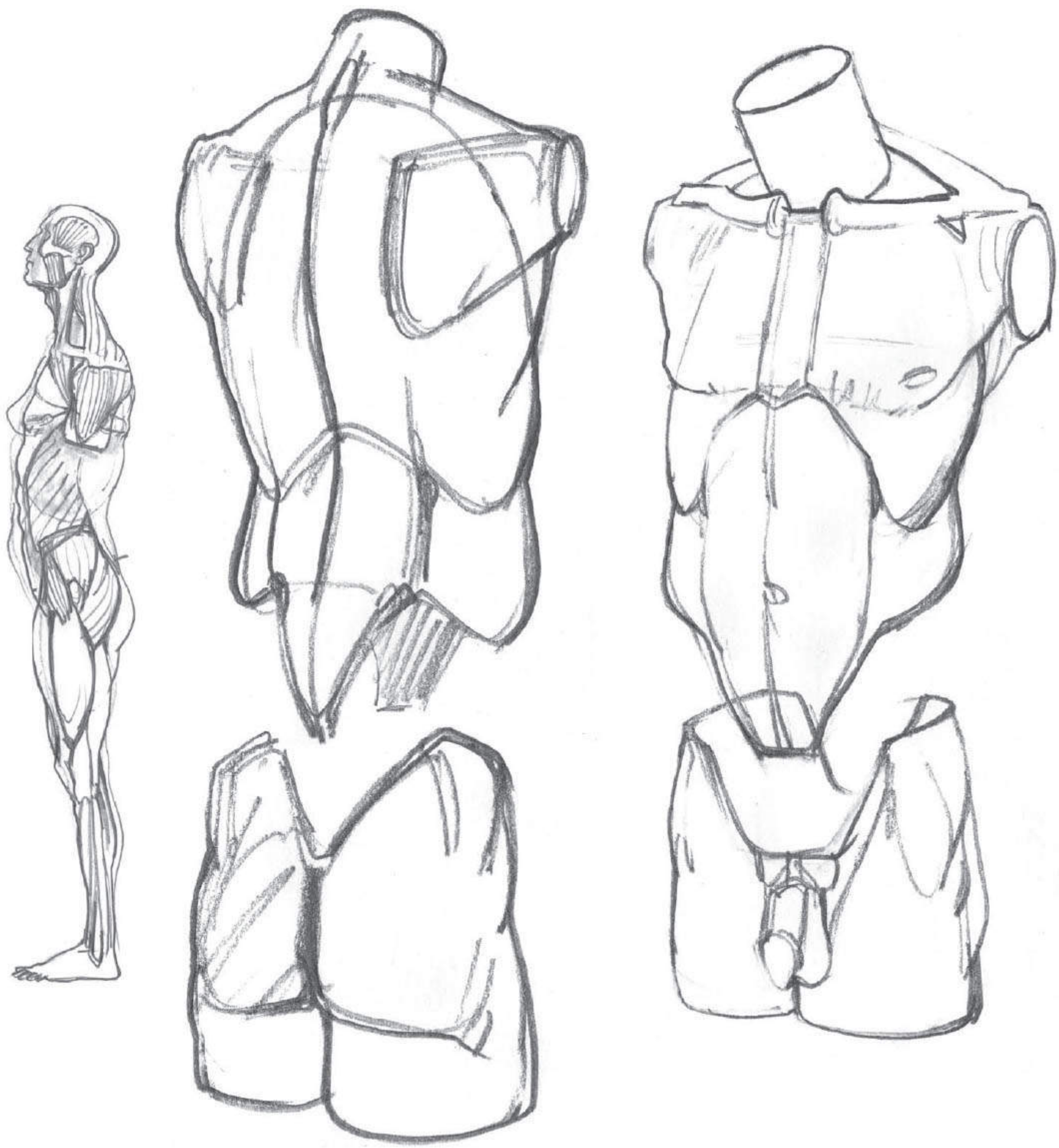

7

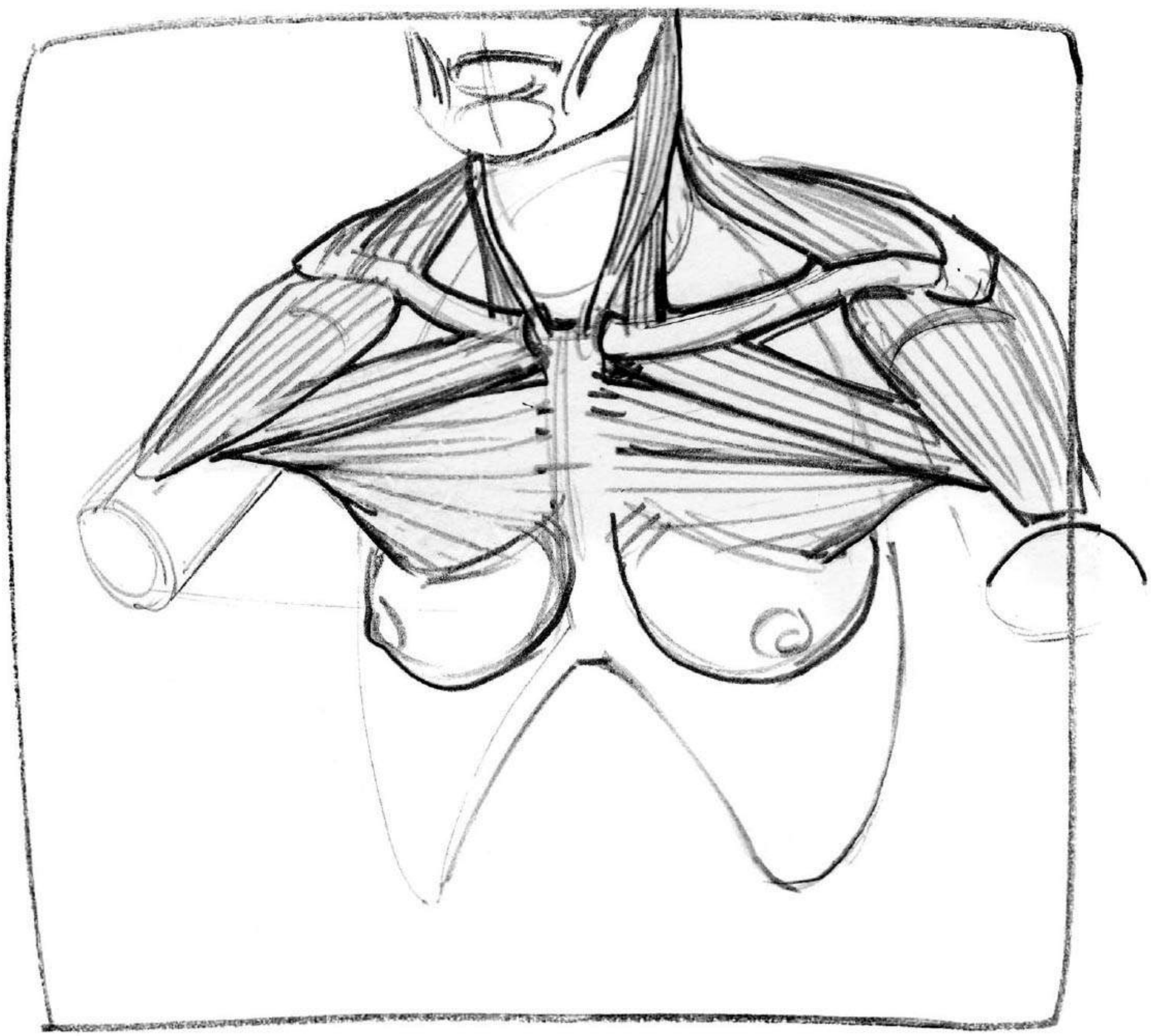

rib
8
7
pel

The spinal muscles (7) and the rectus abdominis muscles (8) are antagonistic (serve opposite functions) between the rib cage and the pelvis.

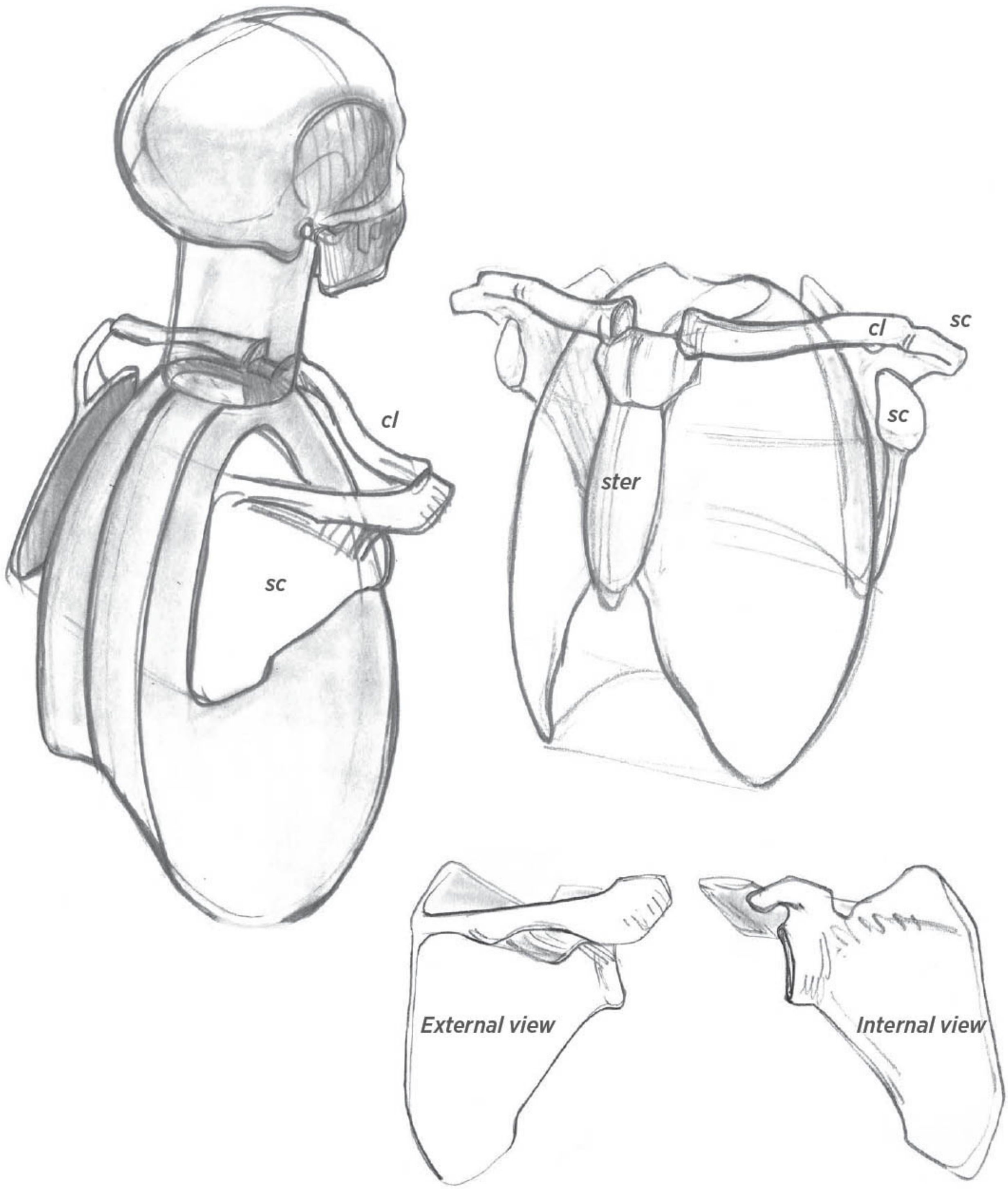


Interlocking of the torso onto the pelvis.



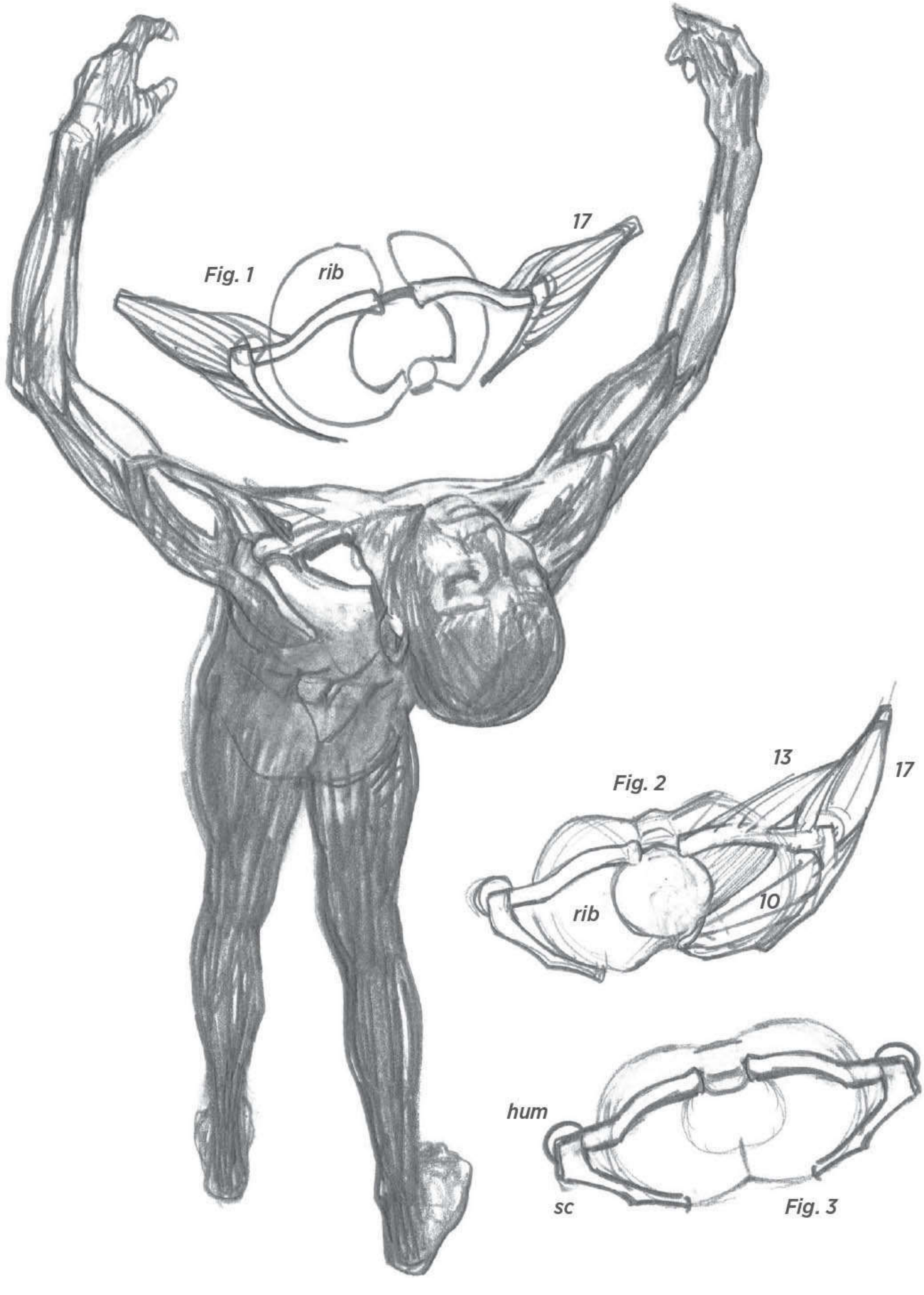


roots of the arm



The shoulder girdle is formed by the first bones of the upper limb: the clavicles and scapulae (shoulder blades). The only point of contact between the skeleton of the upper limb and the rib cage is found between the clavicle (cl) and the sternum (ster).

All movements of the limb involve the shoulder girdle, especially when the arm is being lifted. The scapula (sc), connected to the clavicle at the top of the shoulder, slides along the body of the rib cage.



17
Fig. 1
rib
13
Fig. 2
17
10
rib
hum
sc
Fig. 3

Fig. 3: *Shoulder girdle formed by the pairs of clavicles (cl) and scapulae (sc). Inserted into them are the deltoid (17), seen in Fig. 1, and the trapezius (13) and the pectoral (13), seen in Fig. 2.*

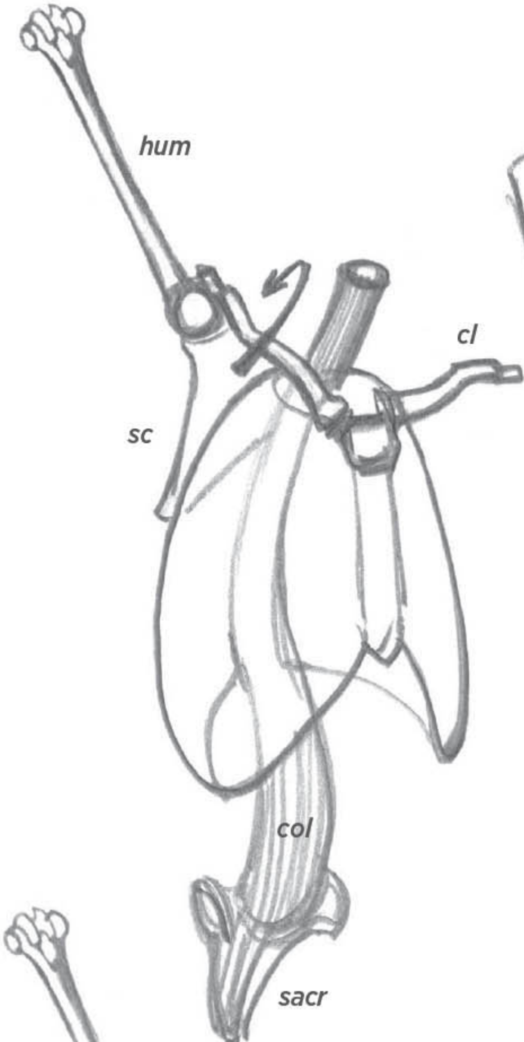
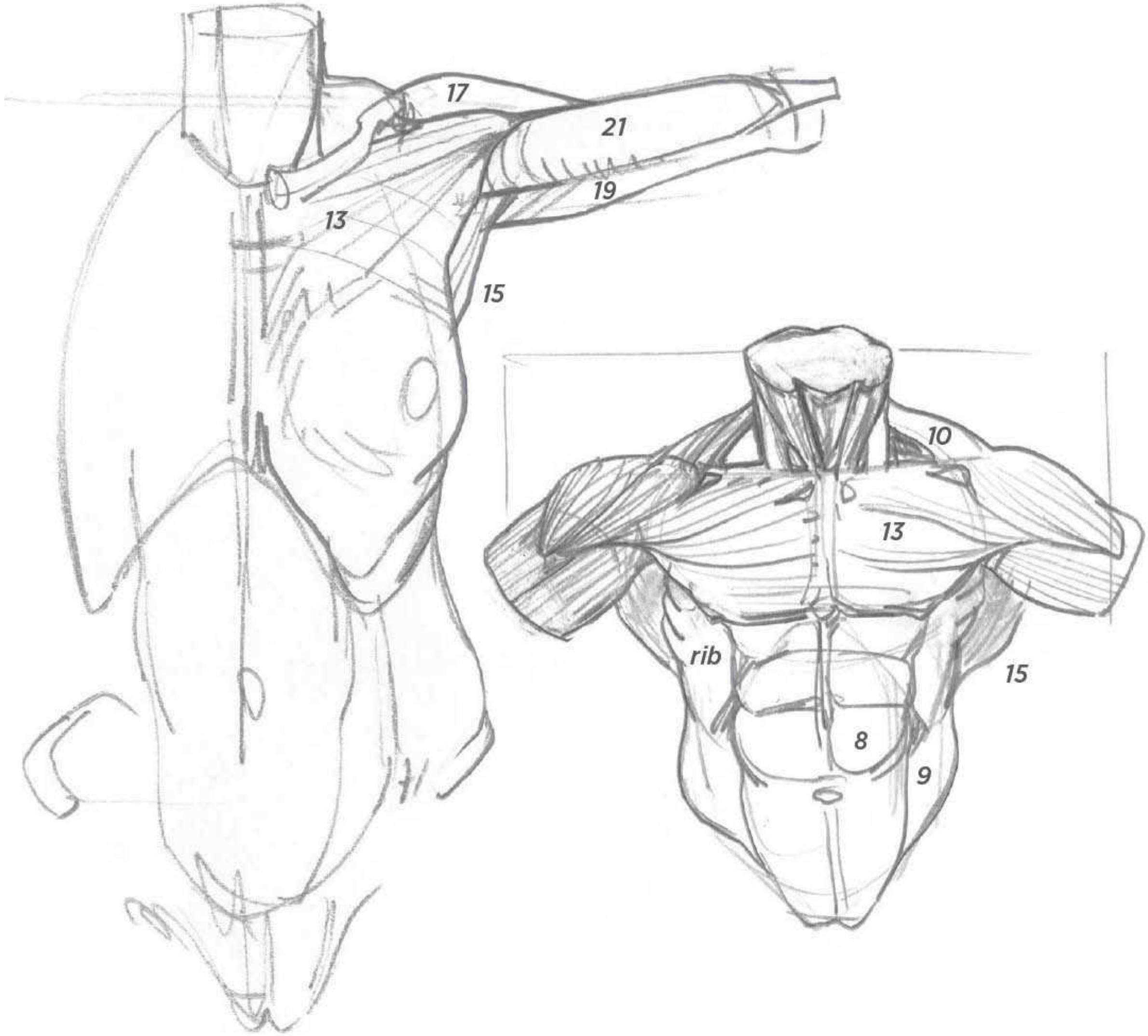
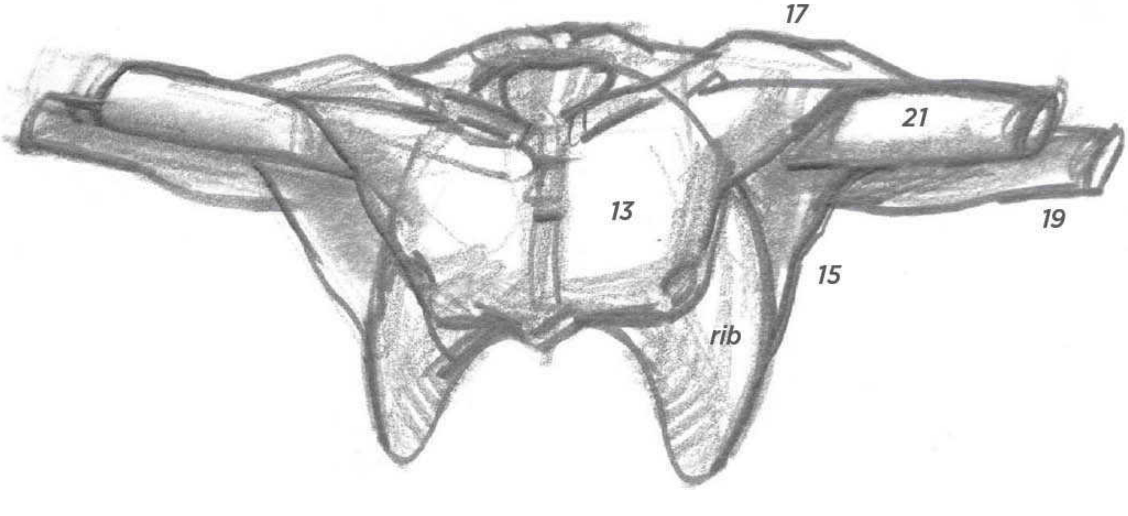


Fig. 1

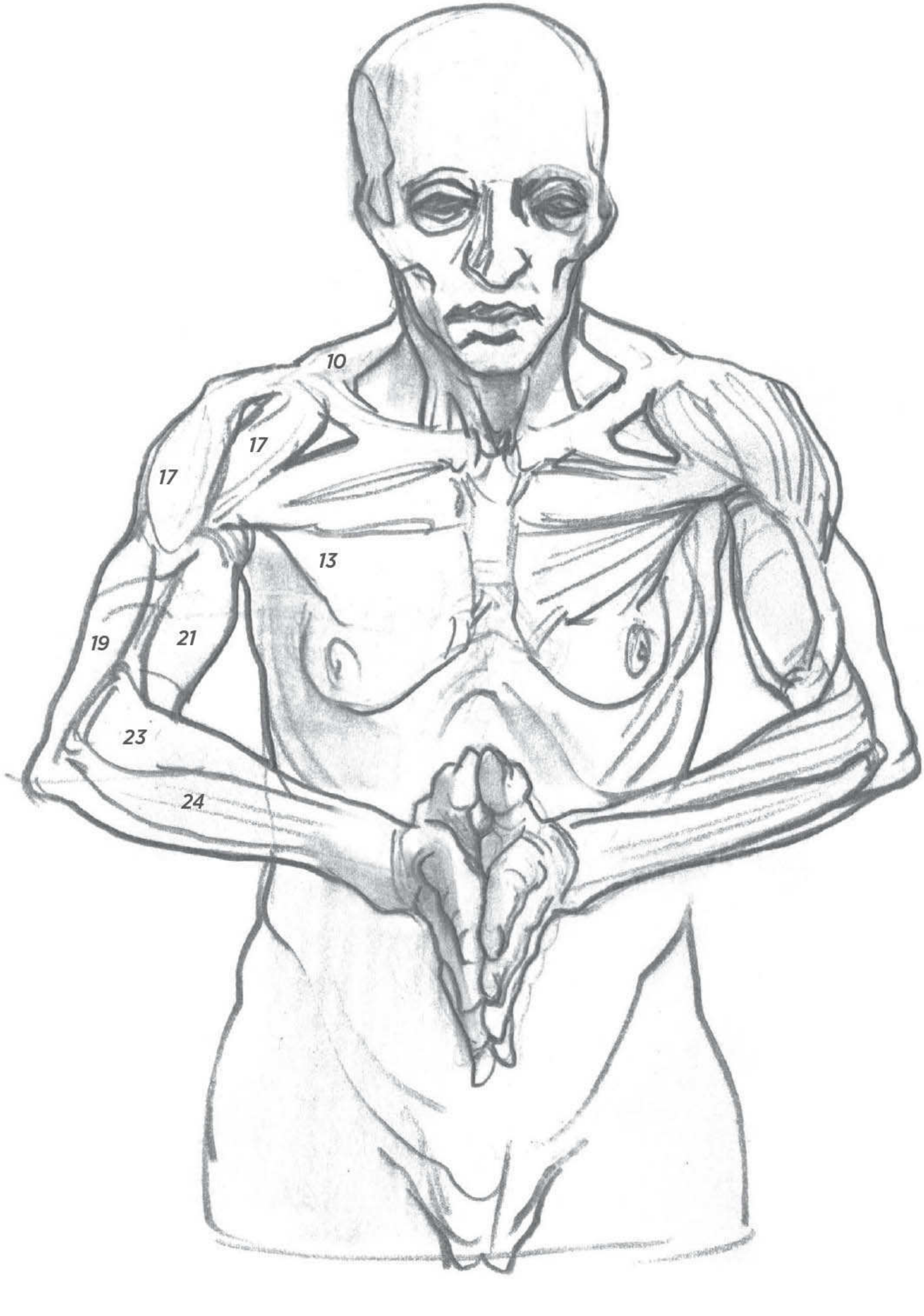
When the arm is fully elevated, the humerus (hum) abuts the spine of the scapula (sc). The clavicle (cl) pivots and rises, carrying the scapula along with it. The scapula tilts and then turns toward the desired direction.

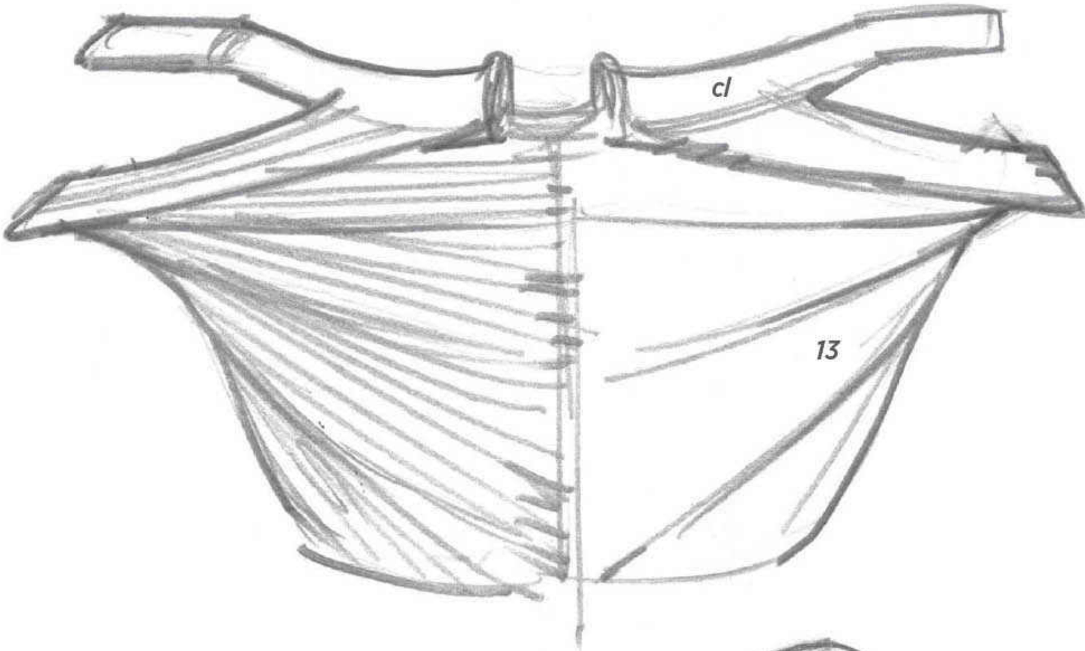
Fig. 1: *The deltoid (17) caps the shoulder joint and outflanks it on each side from this viewpoint.*


17
21
19
13
15
10
13
rib
15
8
9

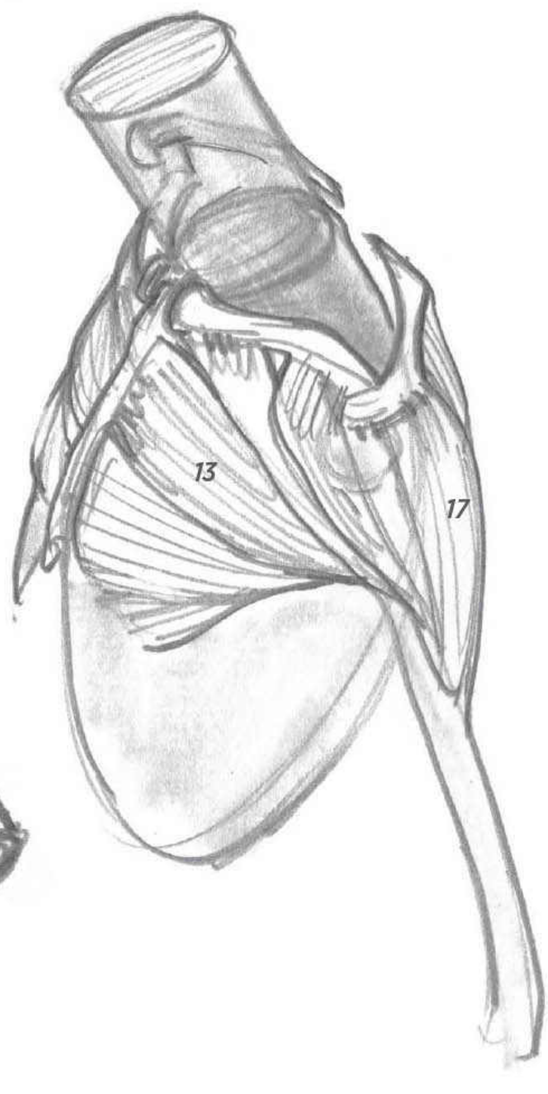

17
21
13
19
15
rib

The rib cage (rib) may be wider on a male than on a female. If he is muscular, the hollow of the armpit will be more defined, surrounded by the muscles of that area.


10
17
17
13
19
21
23
24


cl
13


13


13
17

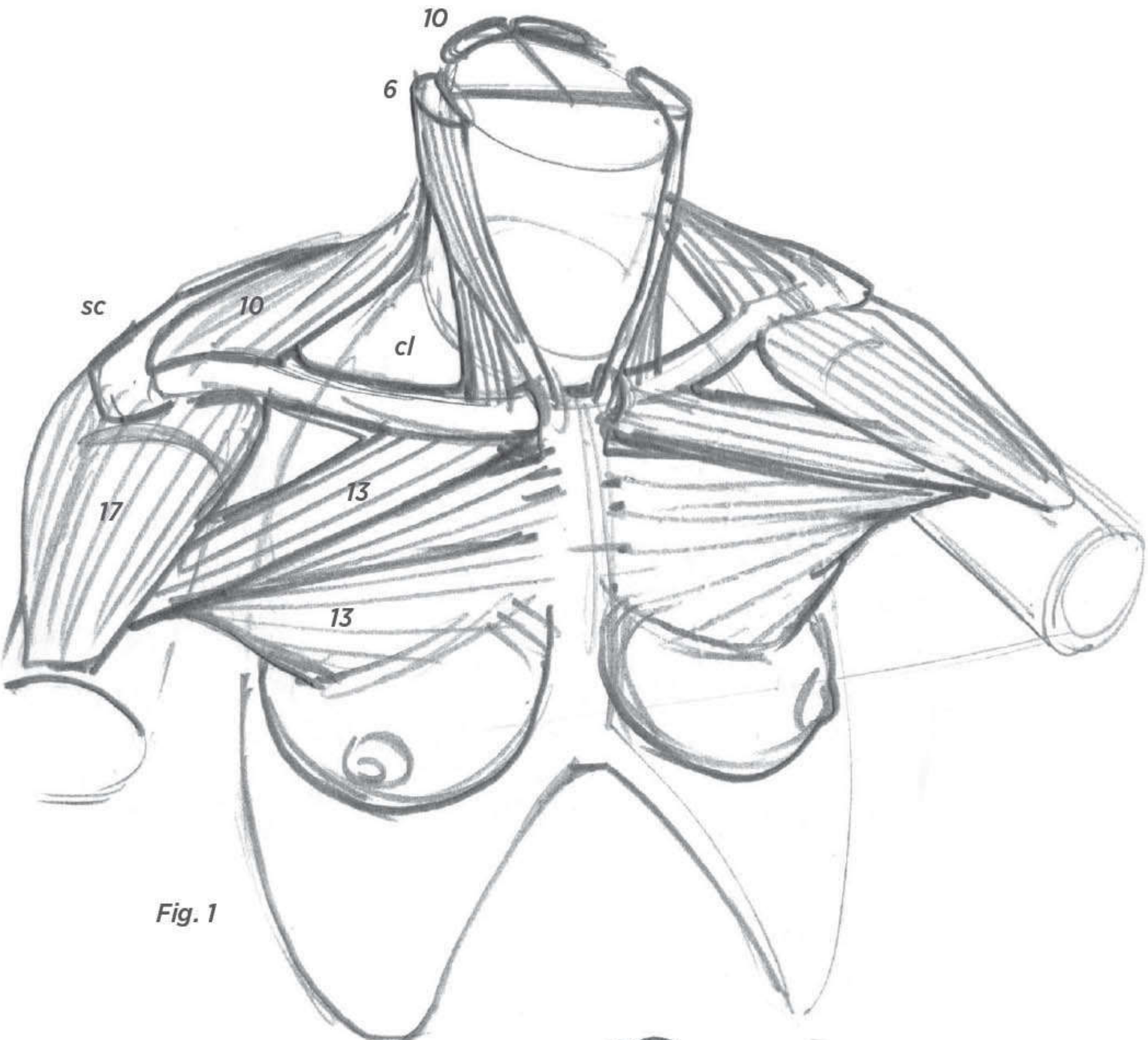


Fig. 1

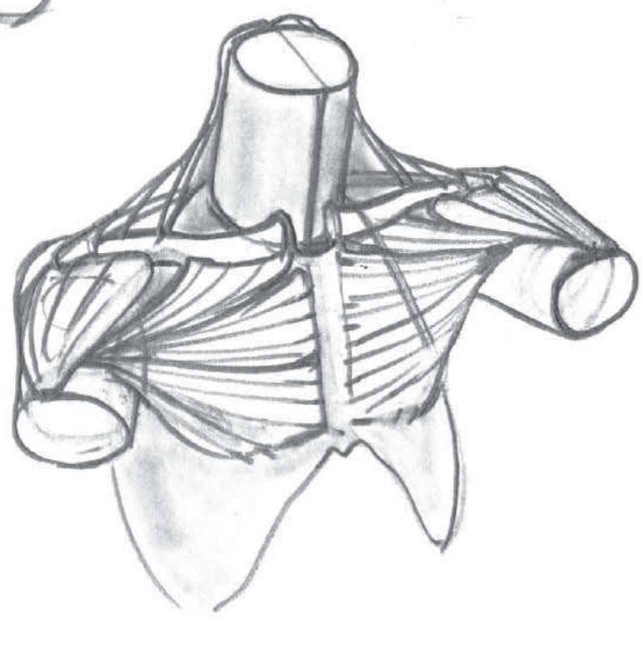
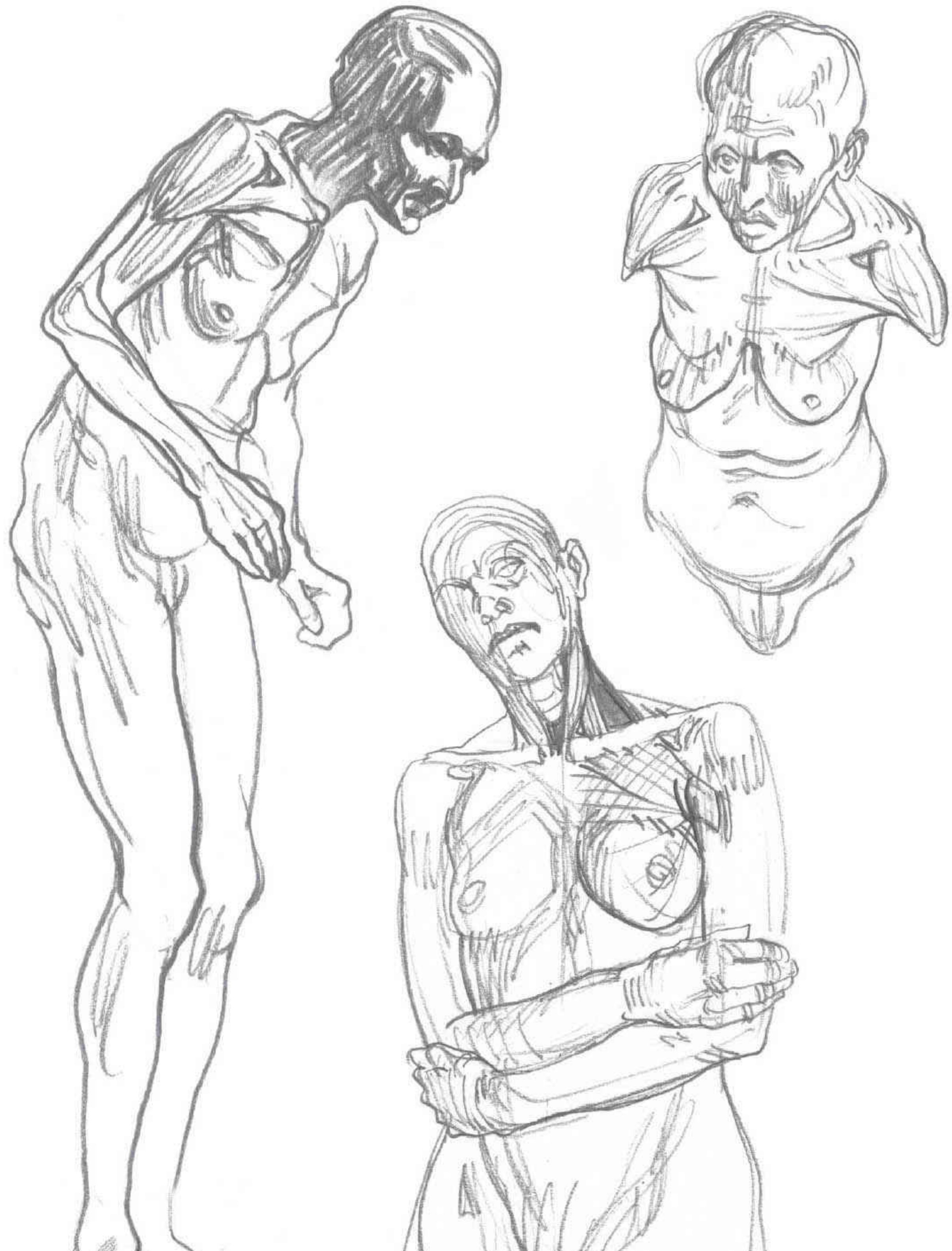


Fig. 1: *The volume of the chest does not coincide with the boundaries of the pectoral muscle. Most often, the chest outflanks the pectoral, descending toward the exterior*.



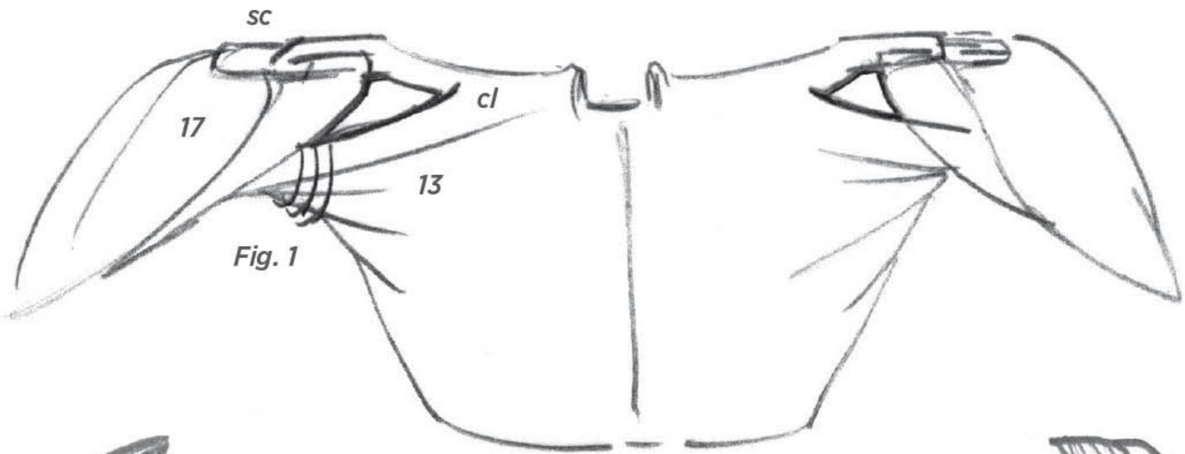
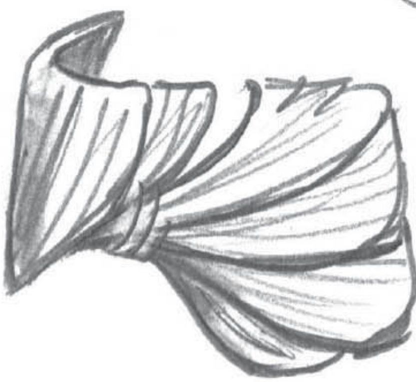
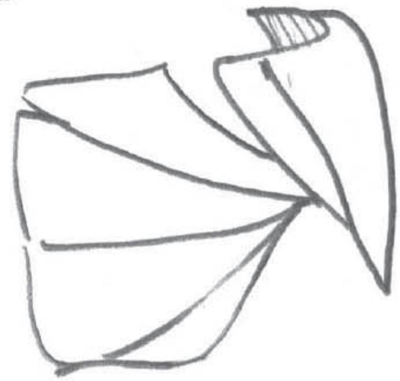


Fig. 1





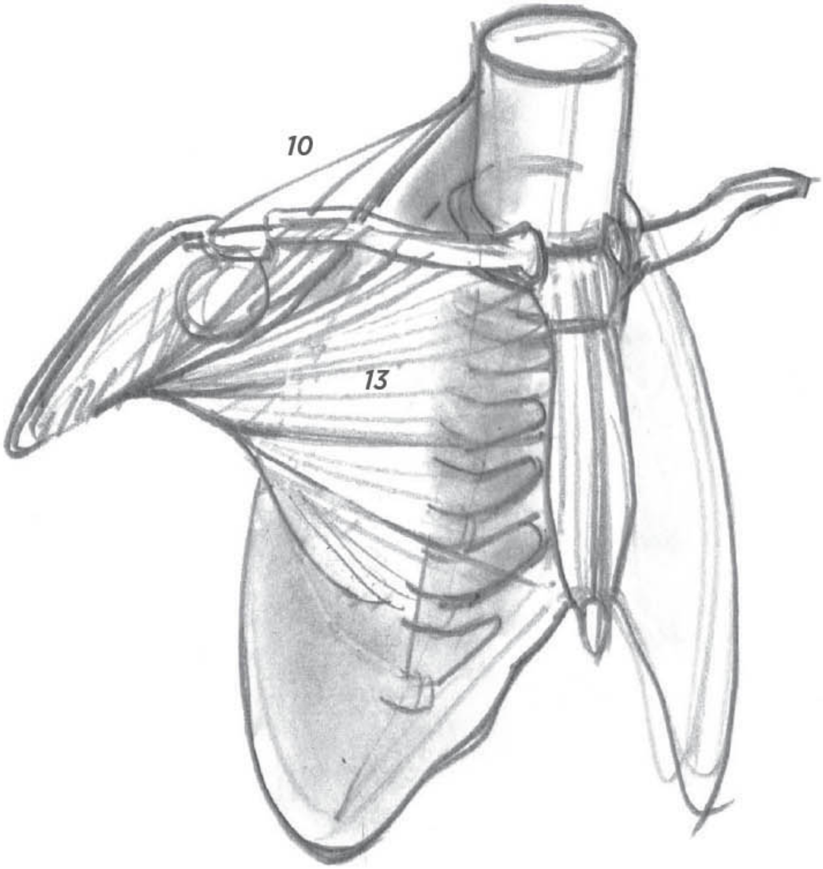


Fig. 1: *The connection between the pectoral (13) and the deltoid (17). Three vertical lines at the point where the pectoral forms the wall of the armpit correspond to the folds that the skin can create here.*

Fig. 2

Fig. 2: *The deltoid (17) is made up of three bundles. The central bundle hides the extremities of the other two, as it dips a little further down on the humerus.*


6
10
14
17
13

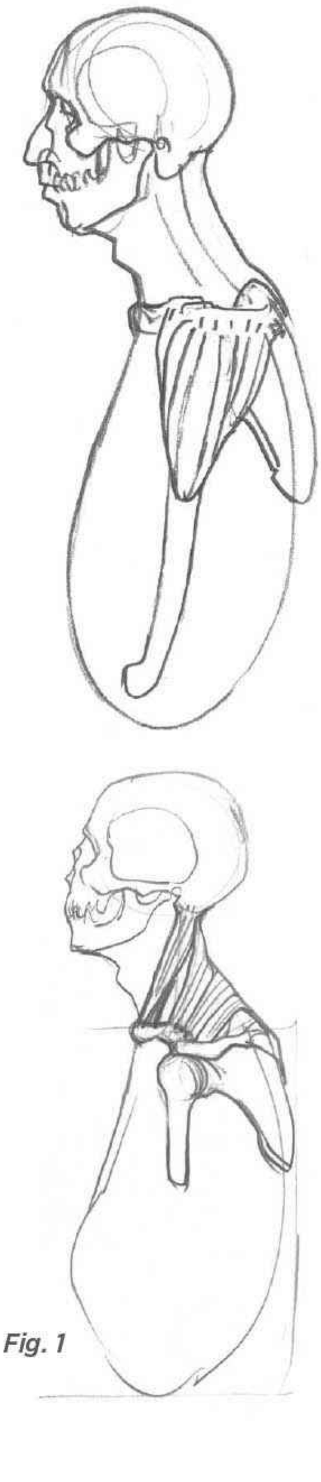
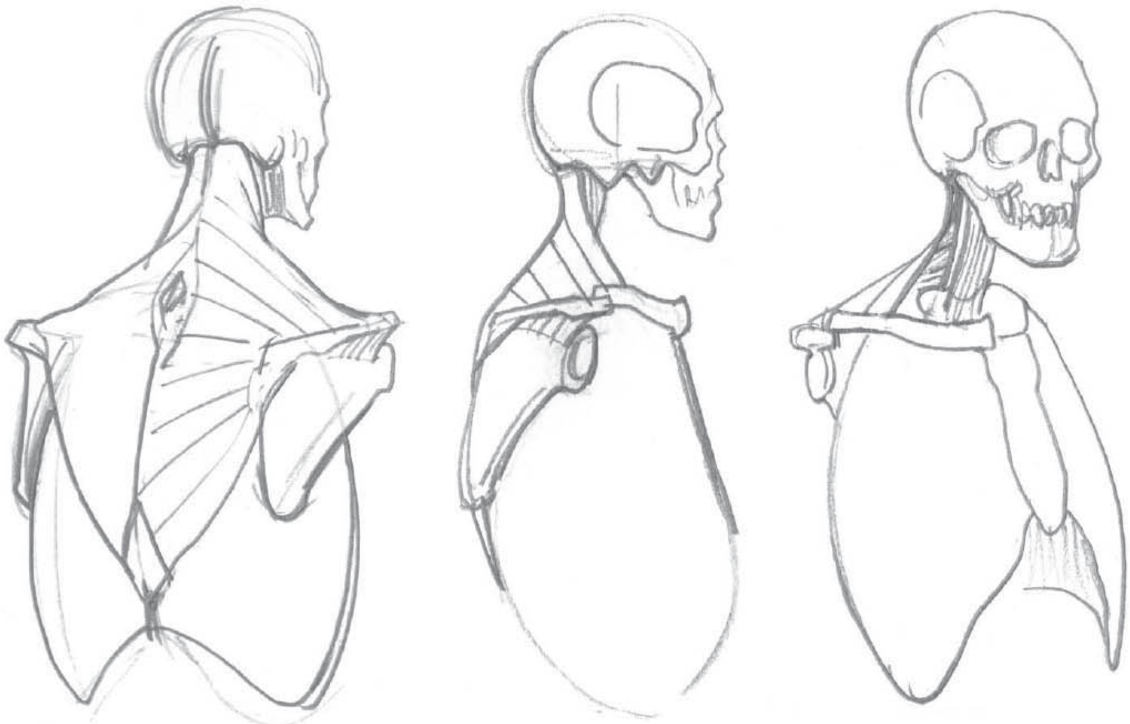


Fig. 1

Fig. 1: *The trapezius has been left incomplete here so as to show the scapula. The head of the humerus can usually be detected under the deltoid (17).*



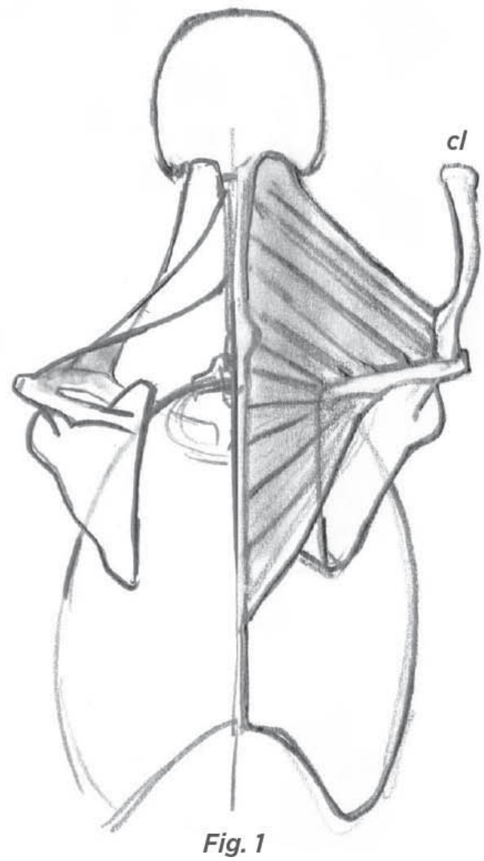
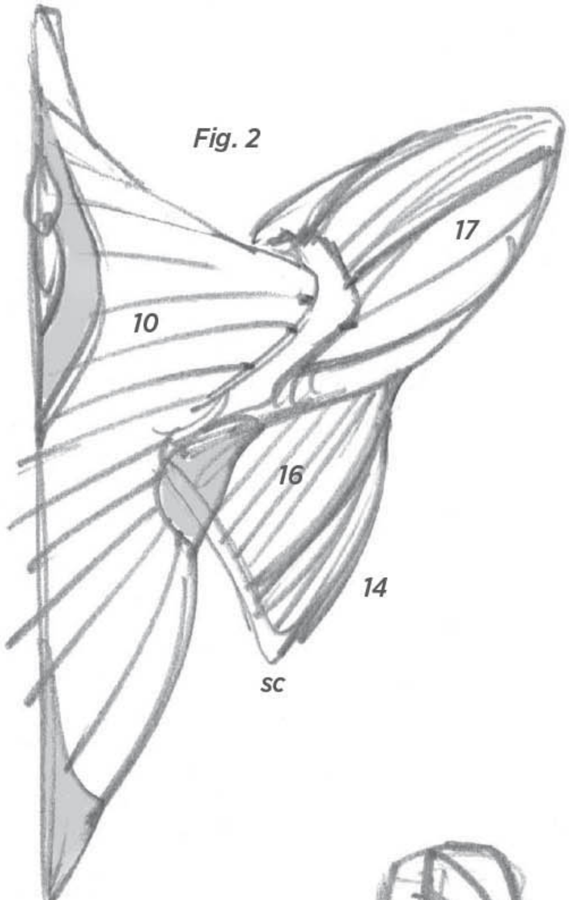


Fig. 1

Fig. 1: *On the right, the clavicle (cl)—shown disconnected from the*

sternum—has been lifted vertically in order to simplify the drawing of the trapezius. On the left, the clavicle in its natural position. Only the clavicular bundle of the trapezius is shown, in order to reveal its spiral shape.

Fig. 2



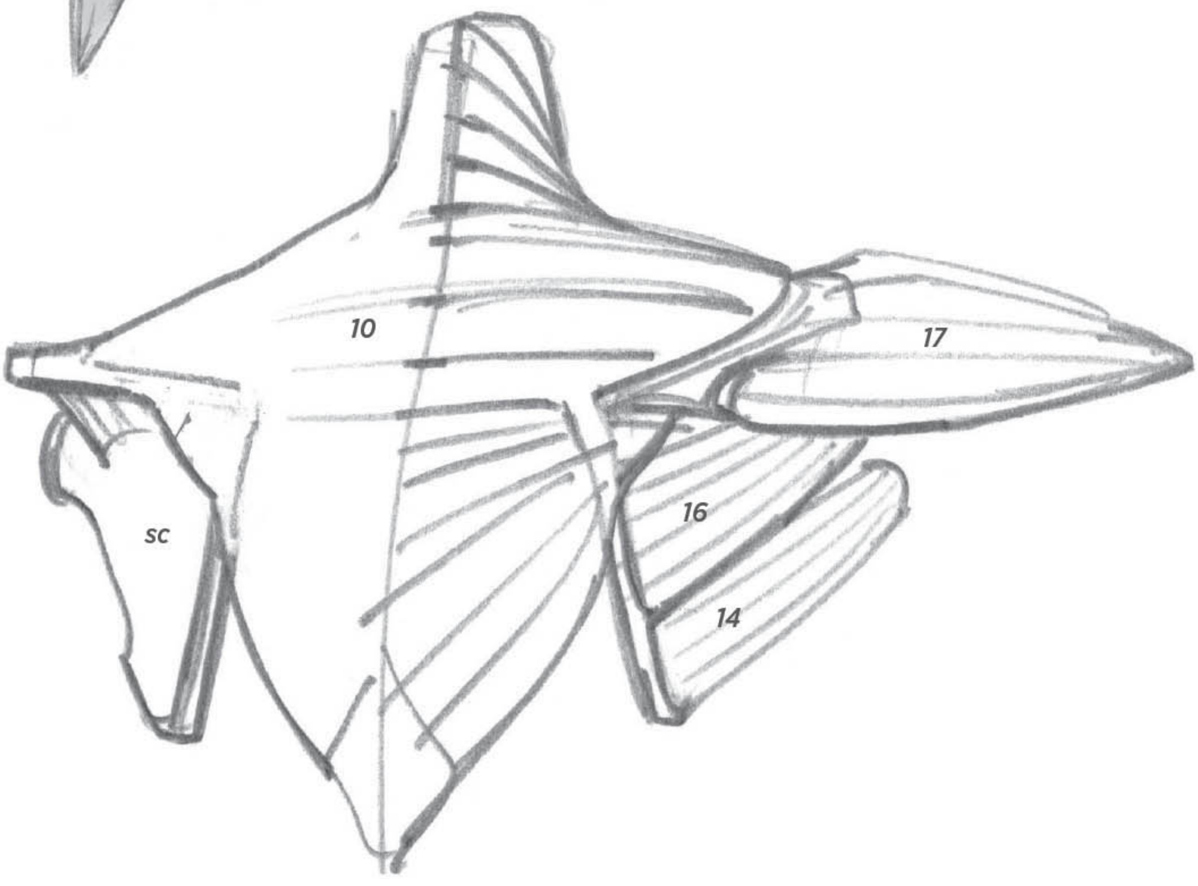


Fig. 2: *The tendons (shown shaded) of the trapezius (10) are laid out around the last cervical (at the beginning of the rib cage), on the spine of the scapula (sc), and at the lower extremity of the muscle.*

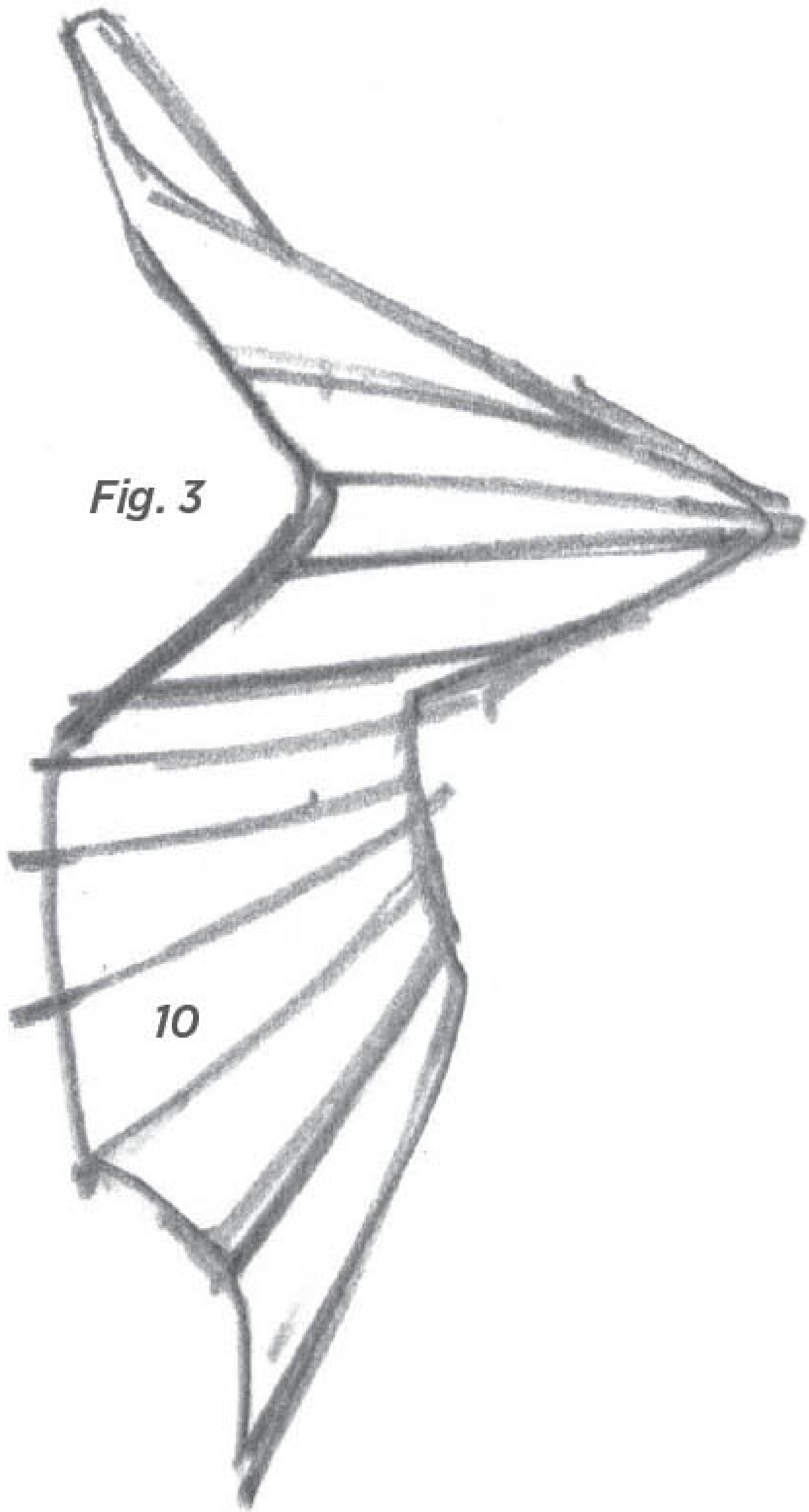
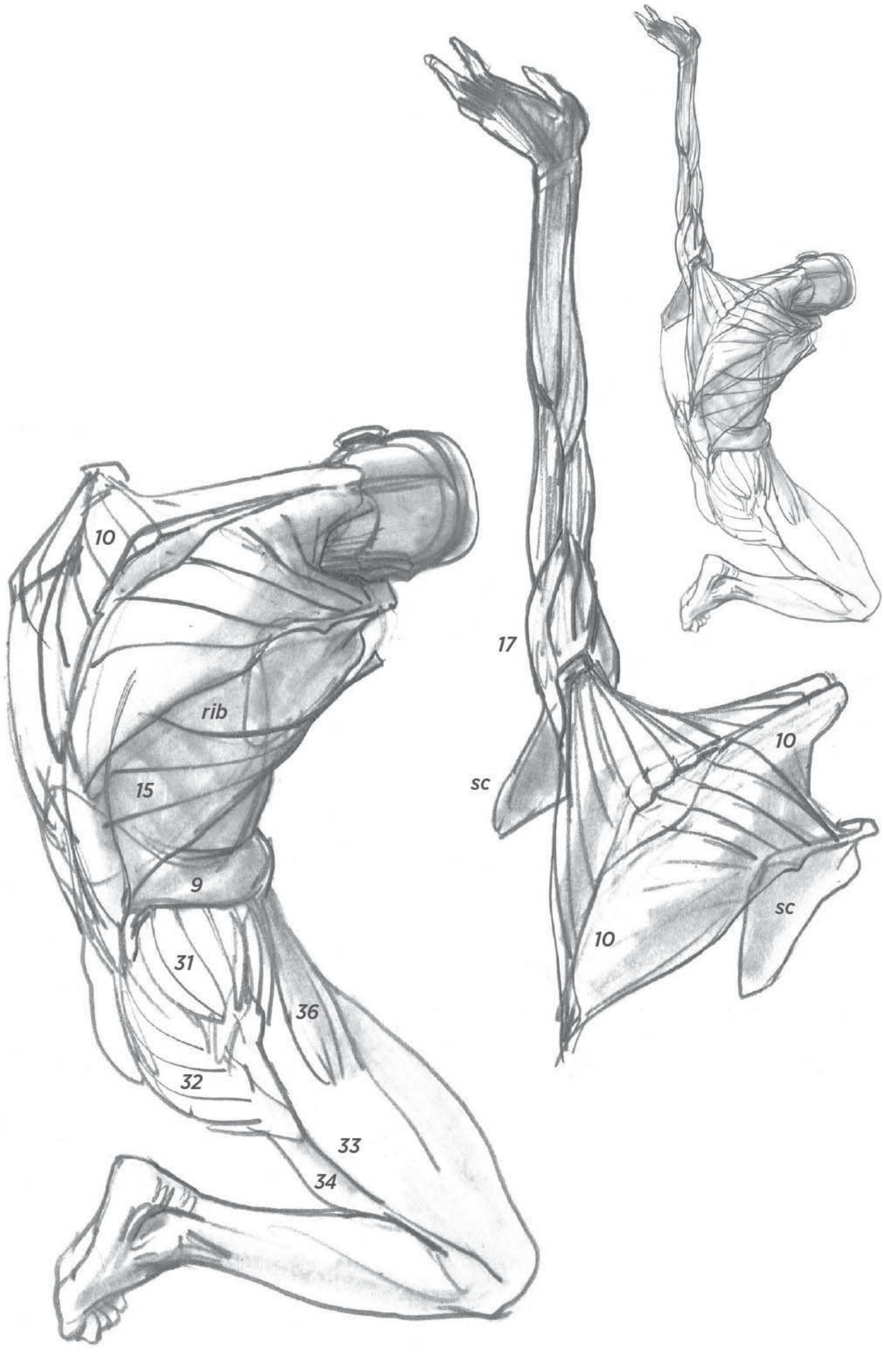
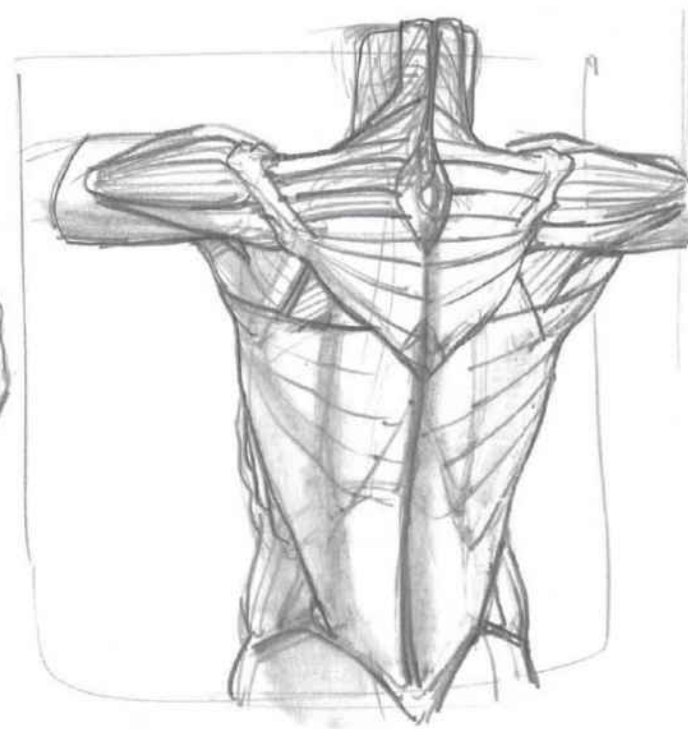


Fig. 3: *Outline of the right trapezius (10). The tendons have not been drawn here.*

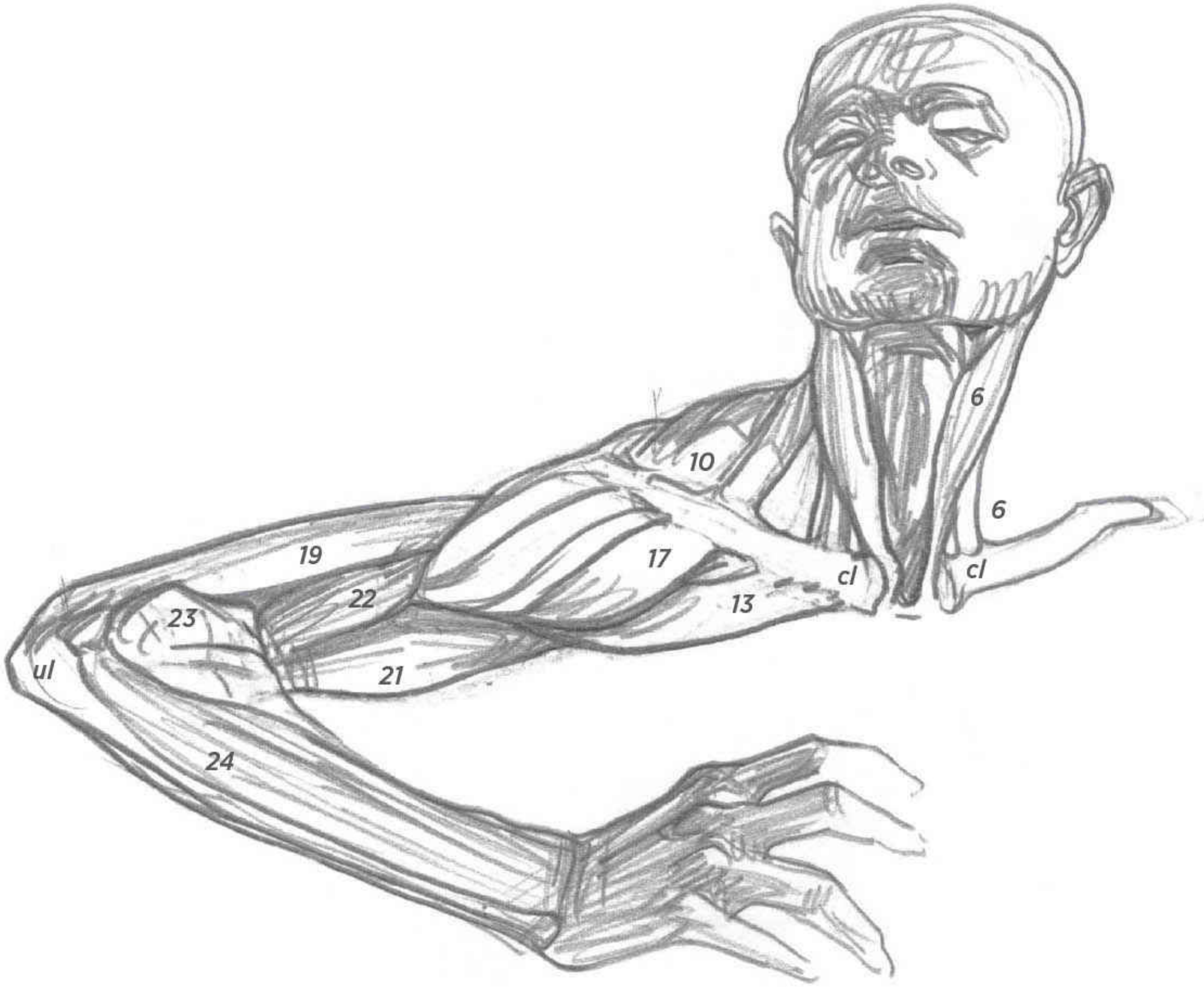


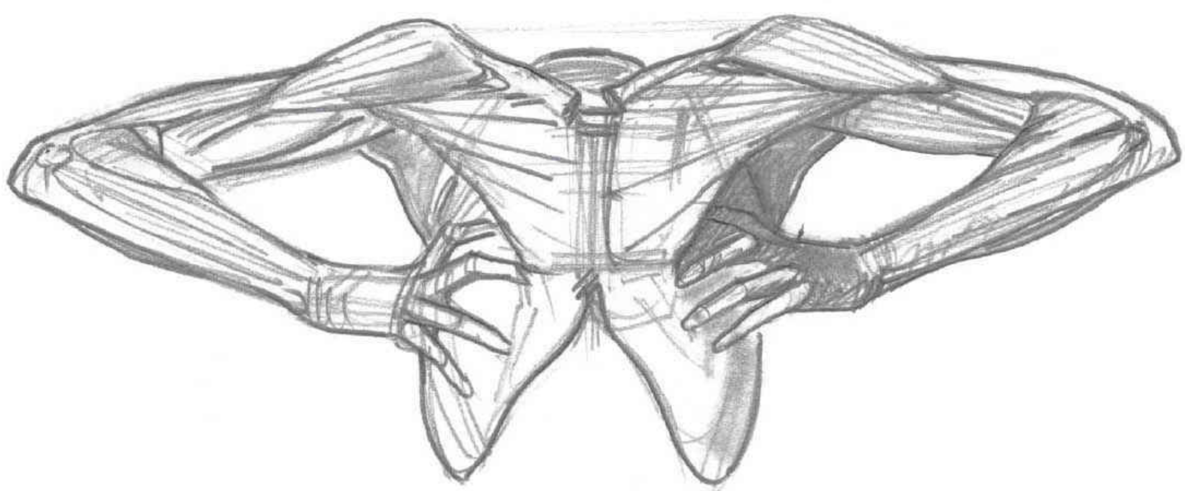
10
rib
15
9
31
36
32
33
34
17
sc
10
sc
10


17
10
16
15
31
32
33
39
40



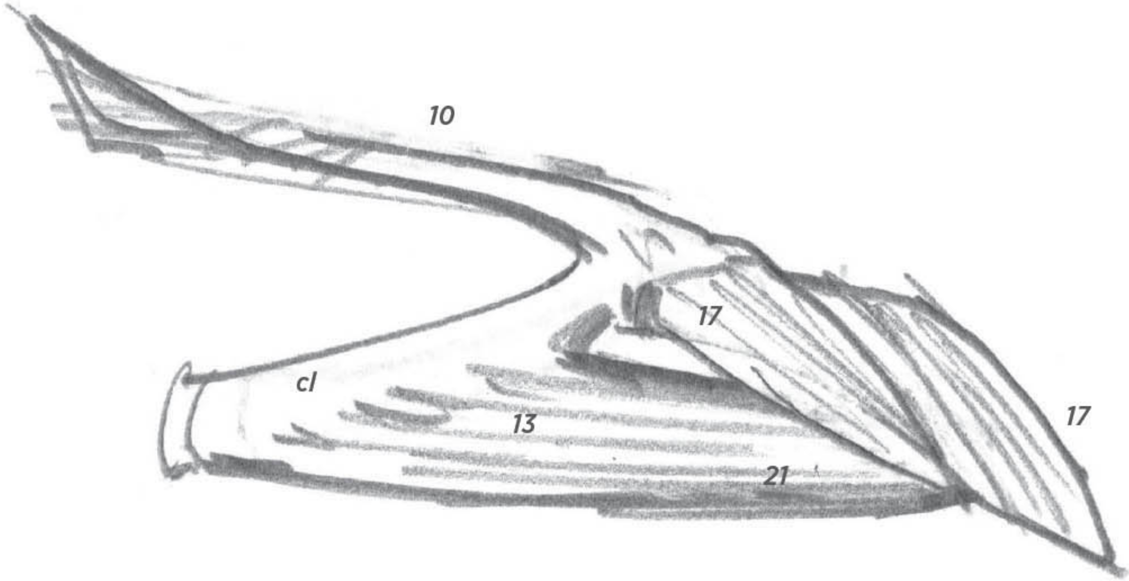

10
7


6
10
6
19
17
cl
cl
22
23
13
ul
21
24

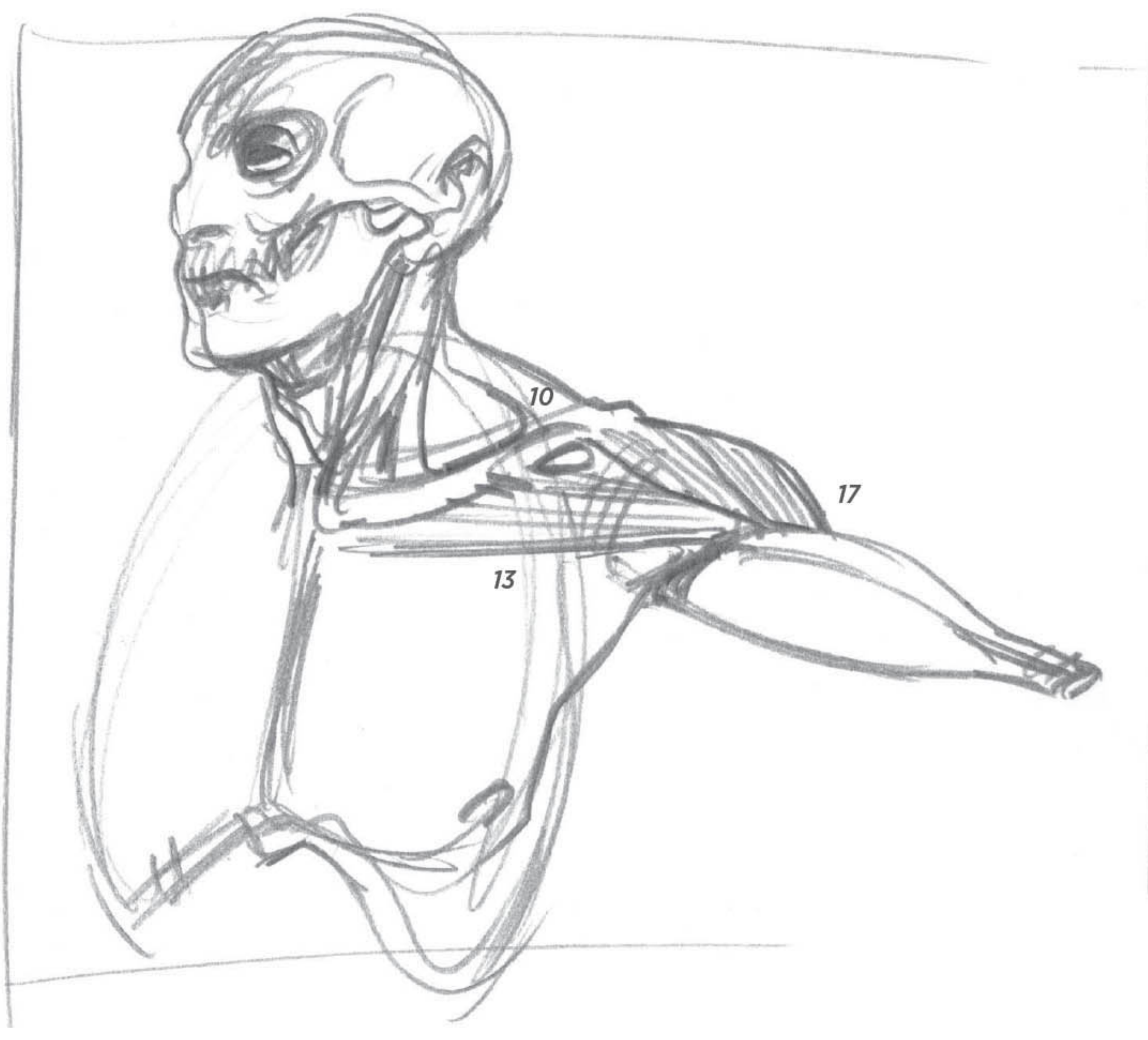


Connections Between Design and Function

The deltoid muscle (17) extends the pattern of the trapezius (10) beyond the clavicle (cl). Together, they lift the arm. But the deltoid can also be understood as a continuation of the pectoral (13). In that case, they bring the arm forward along the axis of the body.



10
17
cl
13
17
21

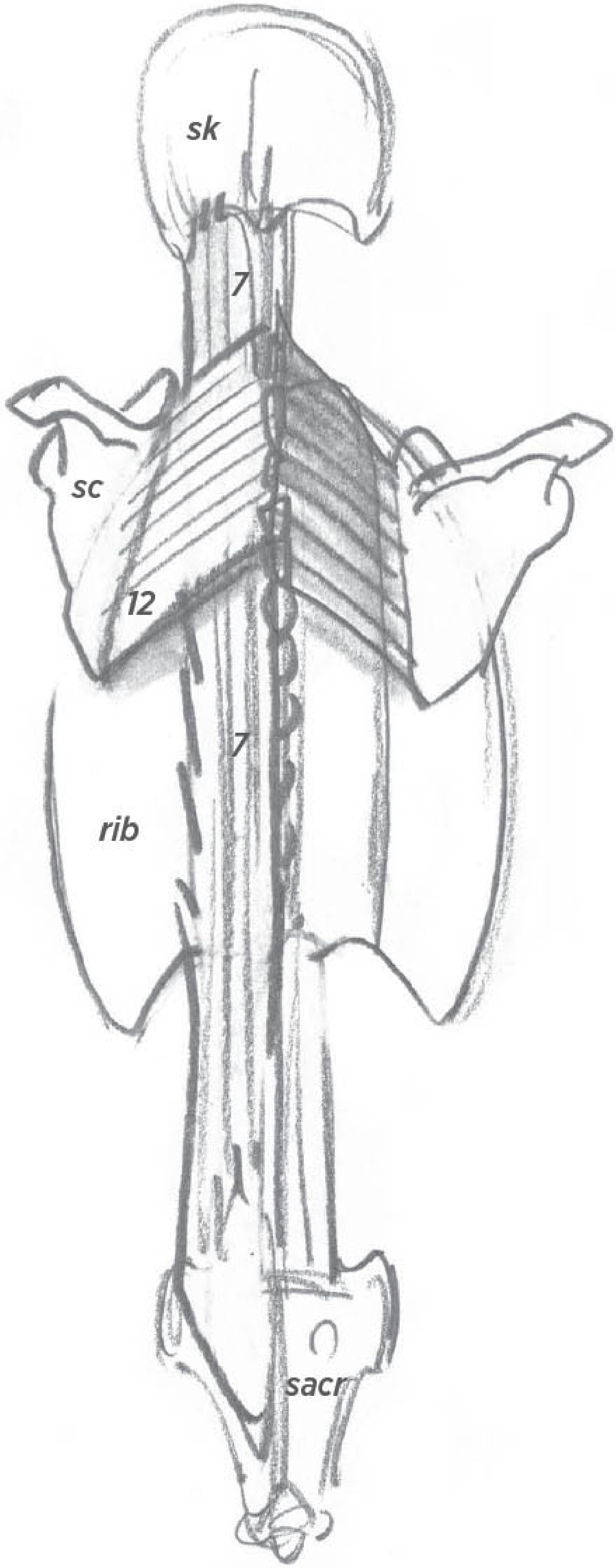


10
17
13

Detail from the drawing below. The pectoral (13) and trapezius (10) are incomplete here.


10
17
17
13
19
21
22
23
26
24

6
13
17
11
8


sk
7
sc
12
7
rib
sacr

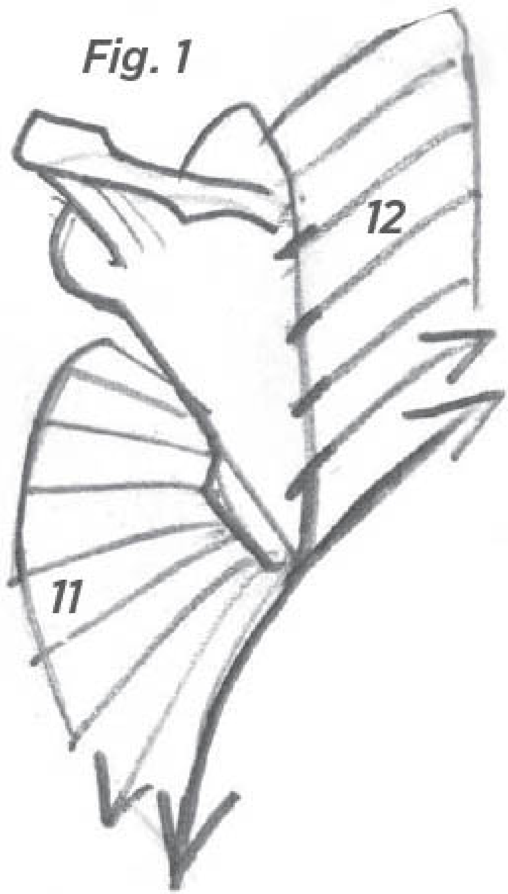


Fig. 1: *Connection between the rhomboid (12) and the serratus anterior (11).*

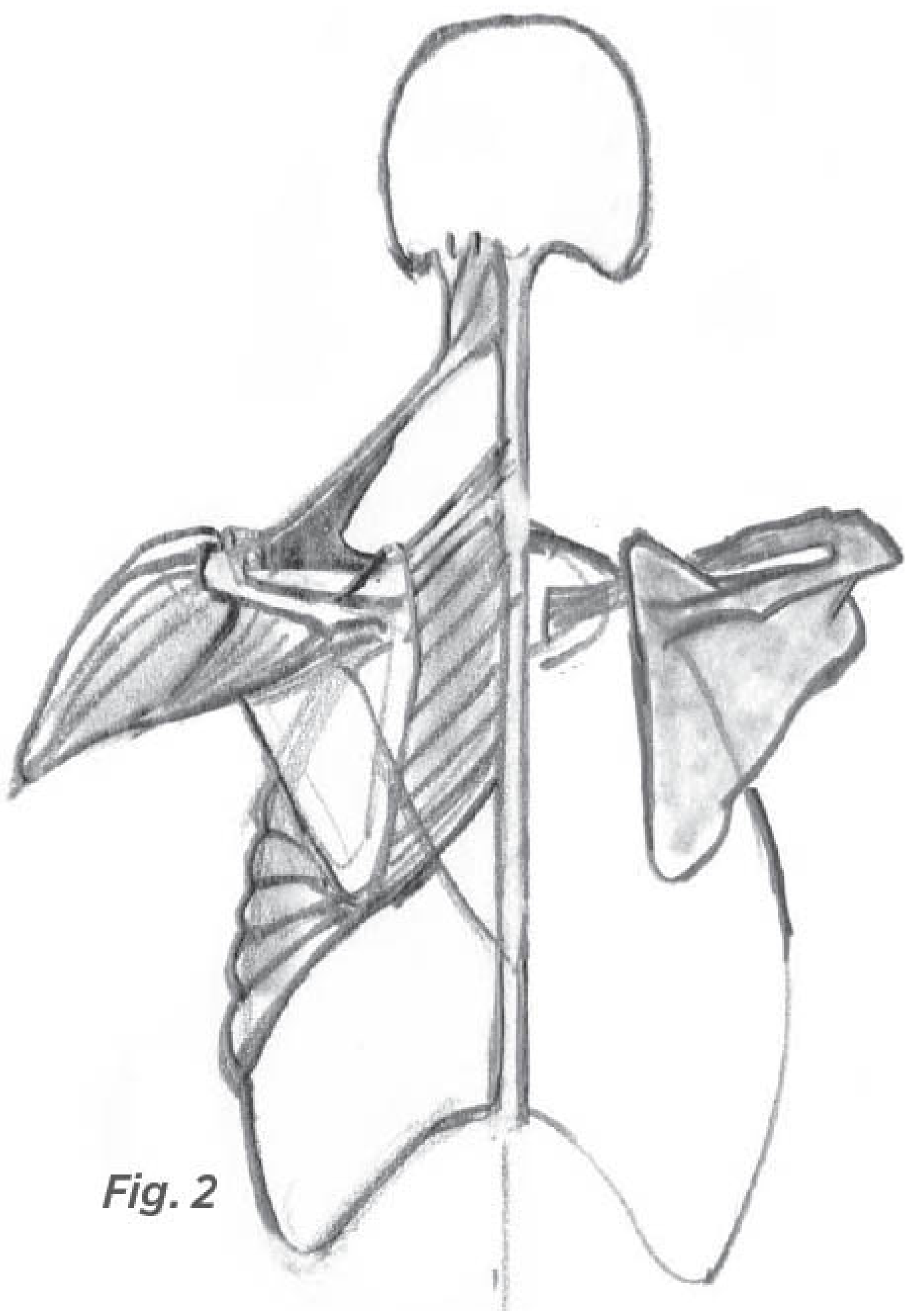


Fig. 2

Fig. 2: *On the left, the trapezius is incomplete. Only its clavicular bundle is shown here, in order to reveal the rhomboid (12).*

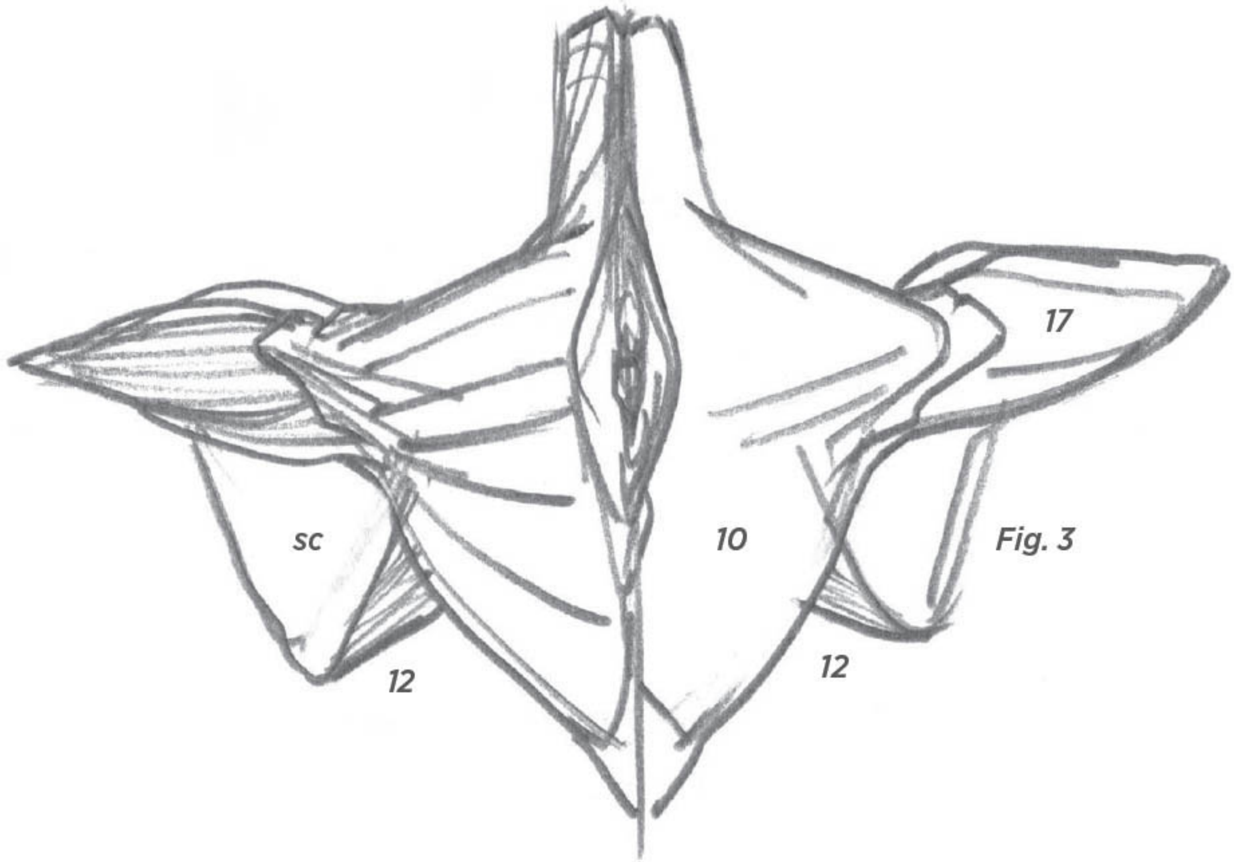


Fig. 3: *The rhomboid (12) is covered in large part by the trapezius*.

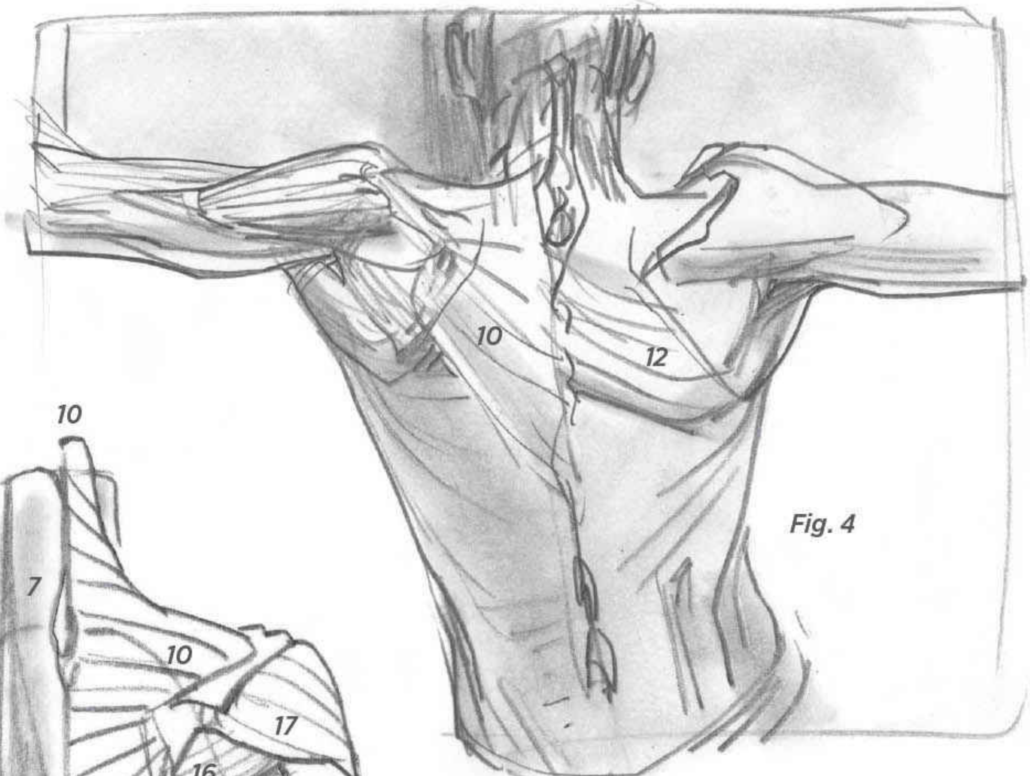
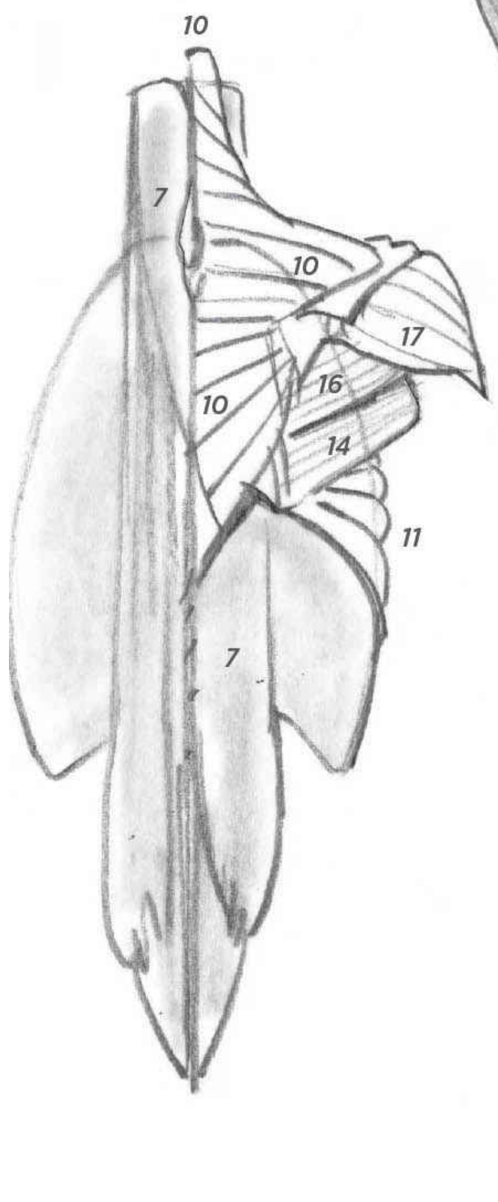
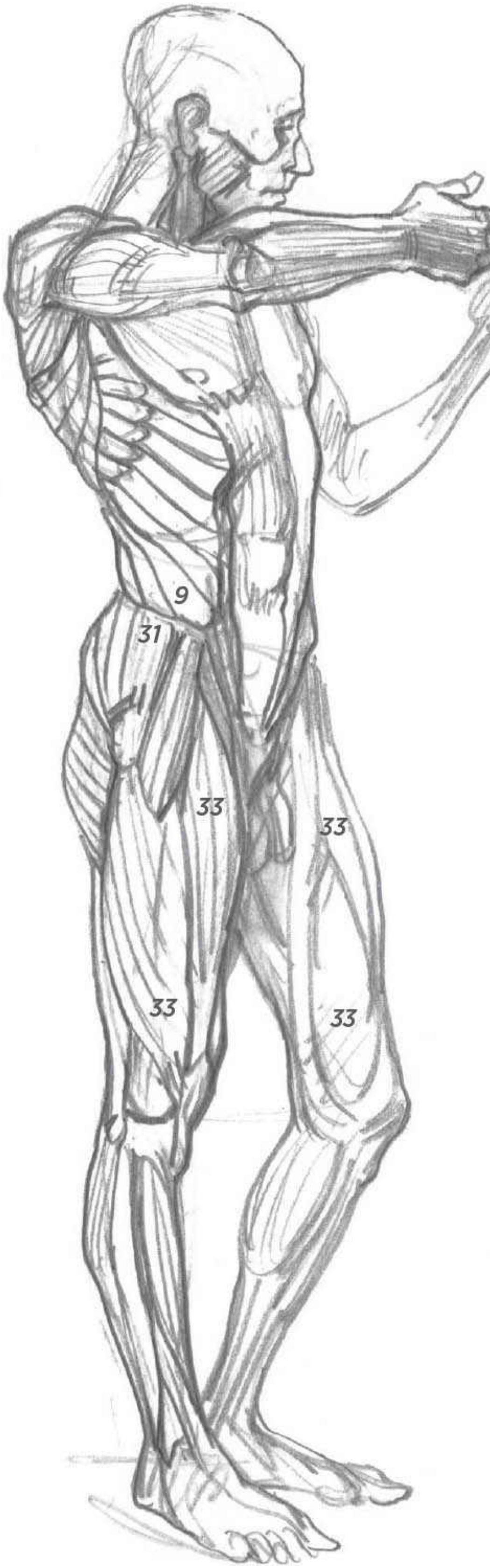
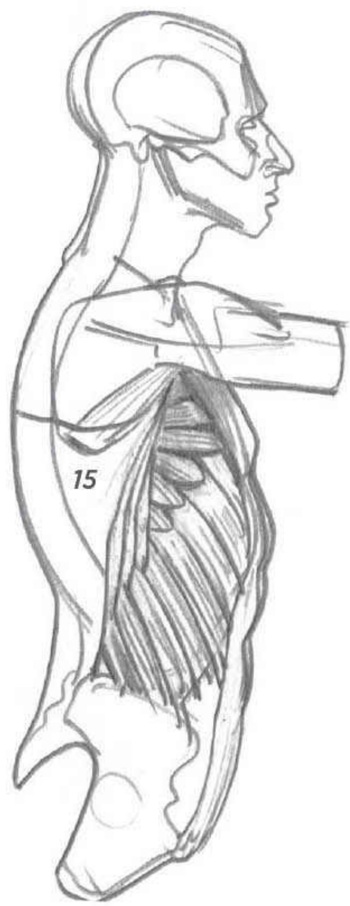


Fig. 4



The rhomboid (12) can be seen under the trapezius (10), which is closer to the surface.





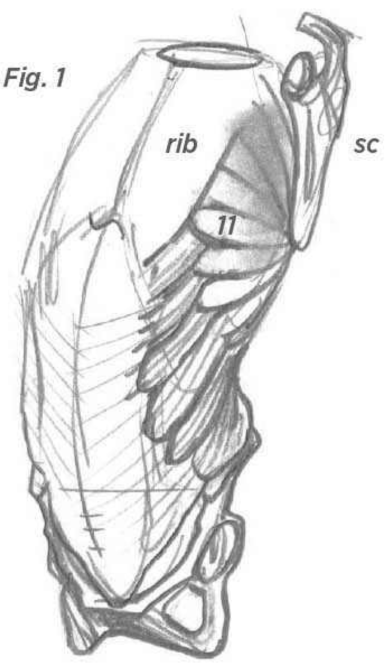
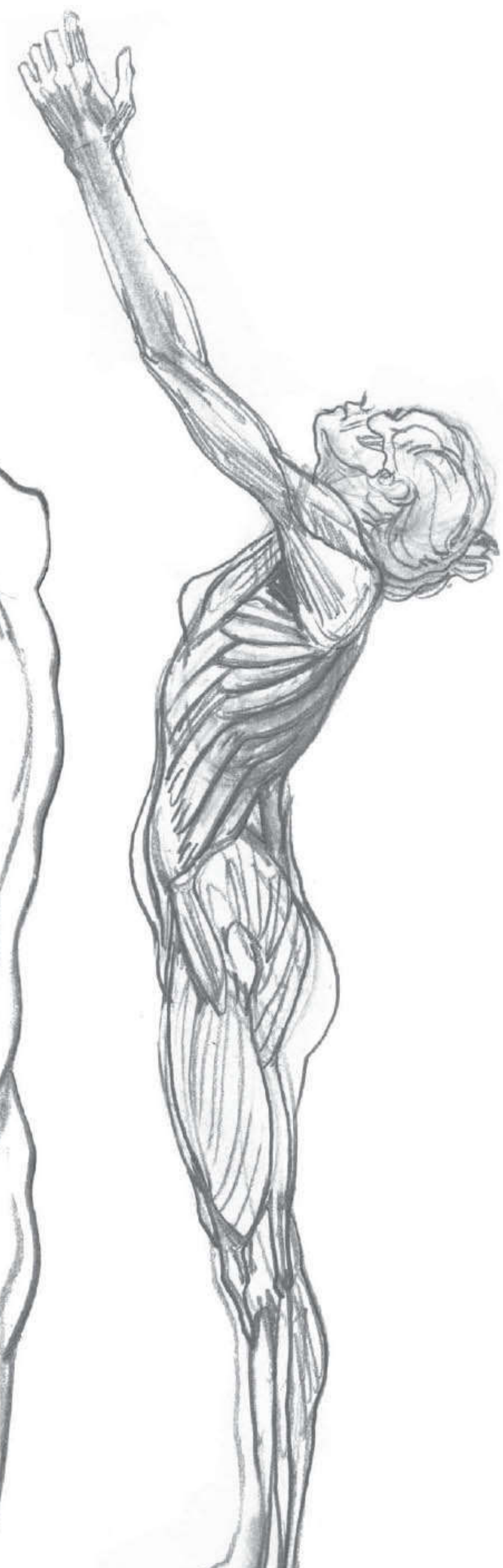
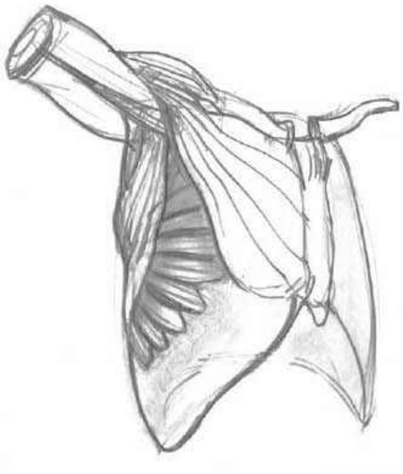


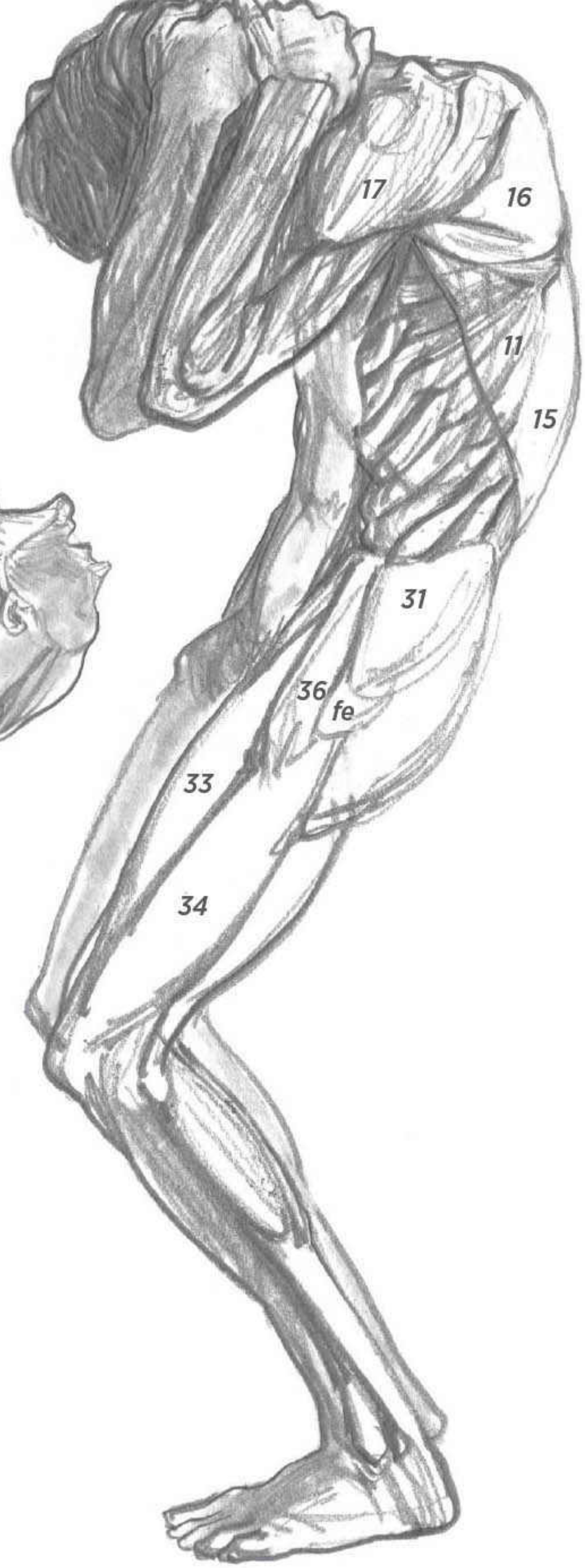
Fig. 1

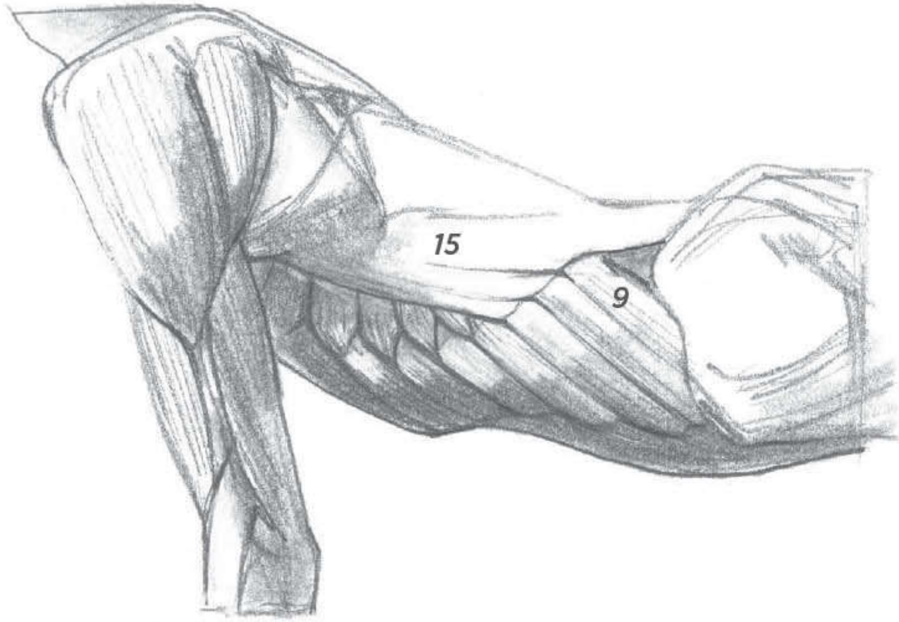
Fig. 1: *In this drawing, we can see the insertion of the serratus anterior (11) into the tip of the scapula (sc), shown here in shortened form. The latissimus dorsi (15) has been removed.*

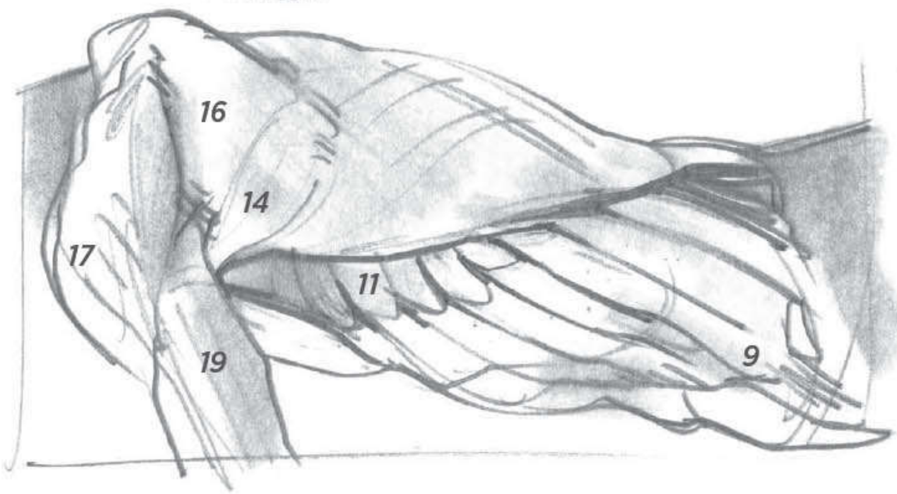

17
14
16
15
11
9
8






17
16
11
15
31
36
fe
33
34

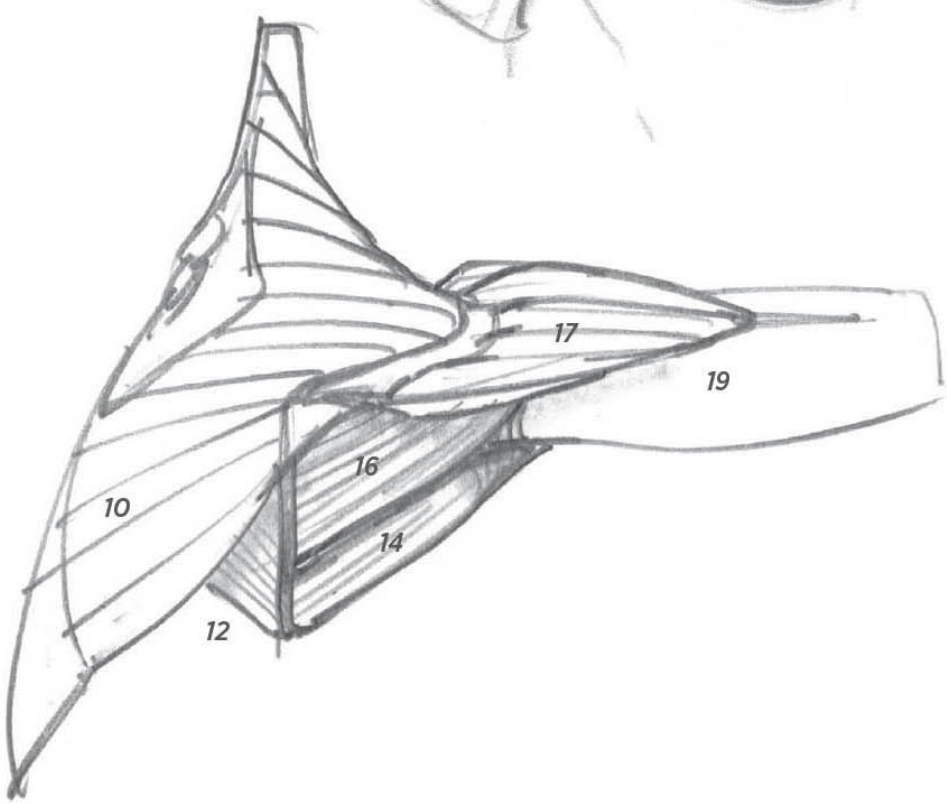

15
9


16
14
17
11
19
9


13
11
15
9
14
19
rib

The serratus anterior (11) is inserted into the scapula, covered in part by the latissimus dorsi (15), yet it is not unusual to be able to see it underneath the latissimus dorsi. However, it is always visible behind the pectoral (13) and the large oblique (9), with which it shares some of the ribs.


17
16
10
12
14
rib


17
19
16
10
14
12

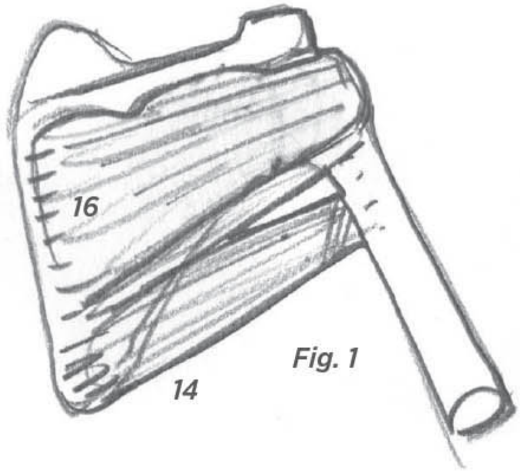


Fig. 1

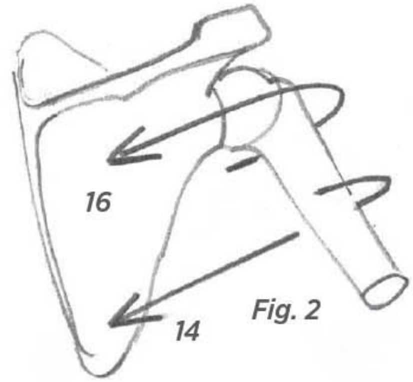
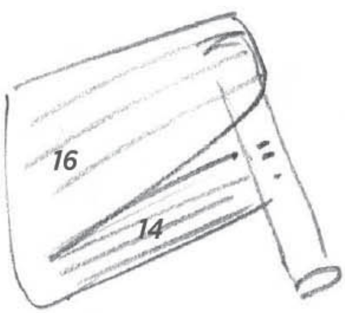


Fig. 2



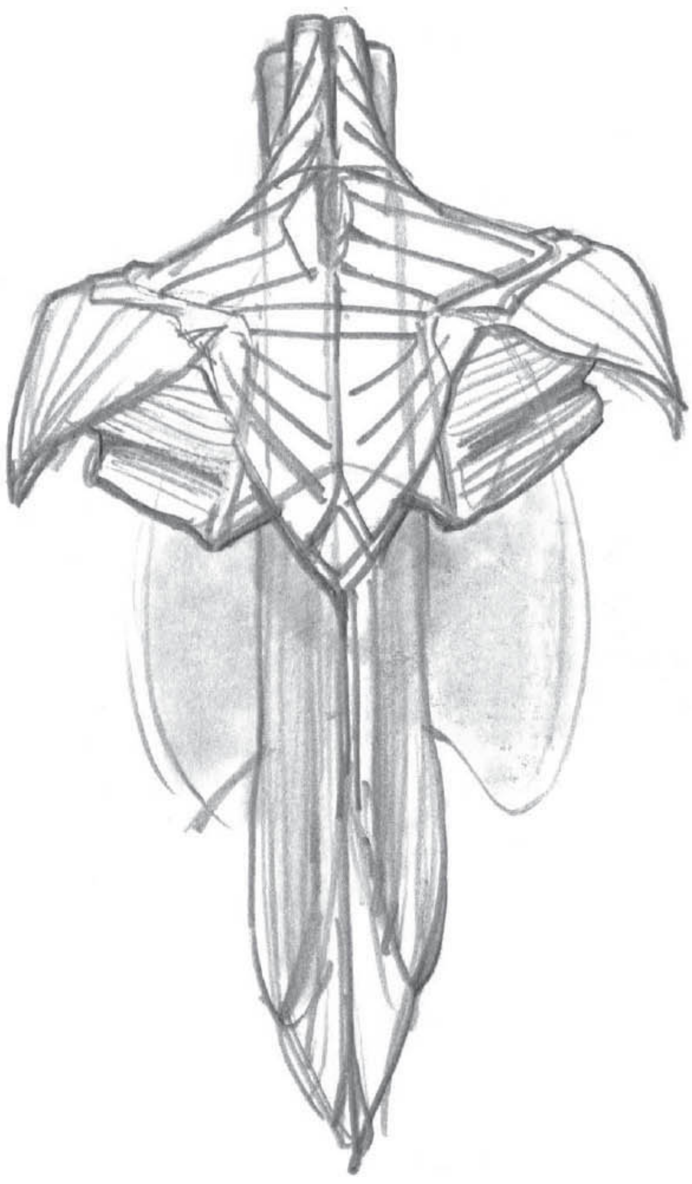


Fig. 1: *This drawing shows—between the infraspinatus (16) and the teres major (14)—the small teres minor muscle. It merges with the infraspinatus and will therefore not be shown as a separate muscle on the rest of the plates.*

Fig. 2: *The infraspinatus (16) and teres major (14) muscles are antagonistic and make the rotation of the arm possible.*


10
17
7
14
15

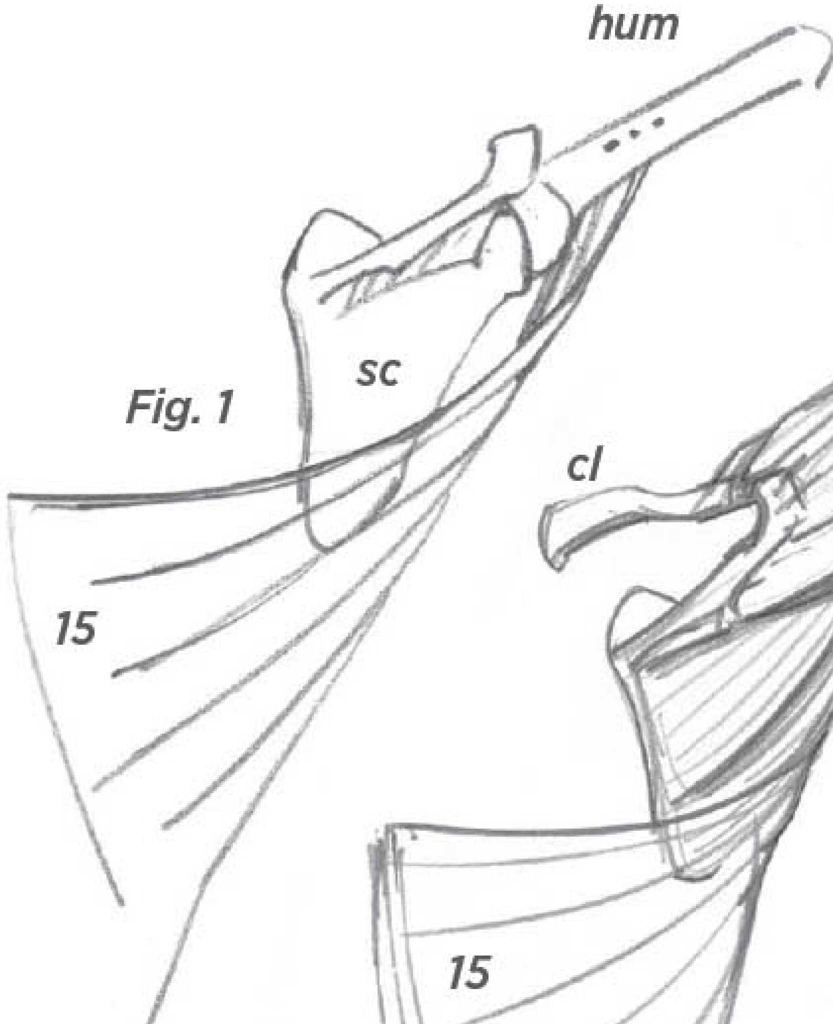


Fig. 1

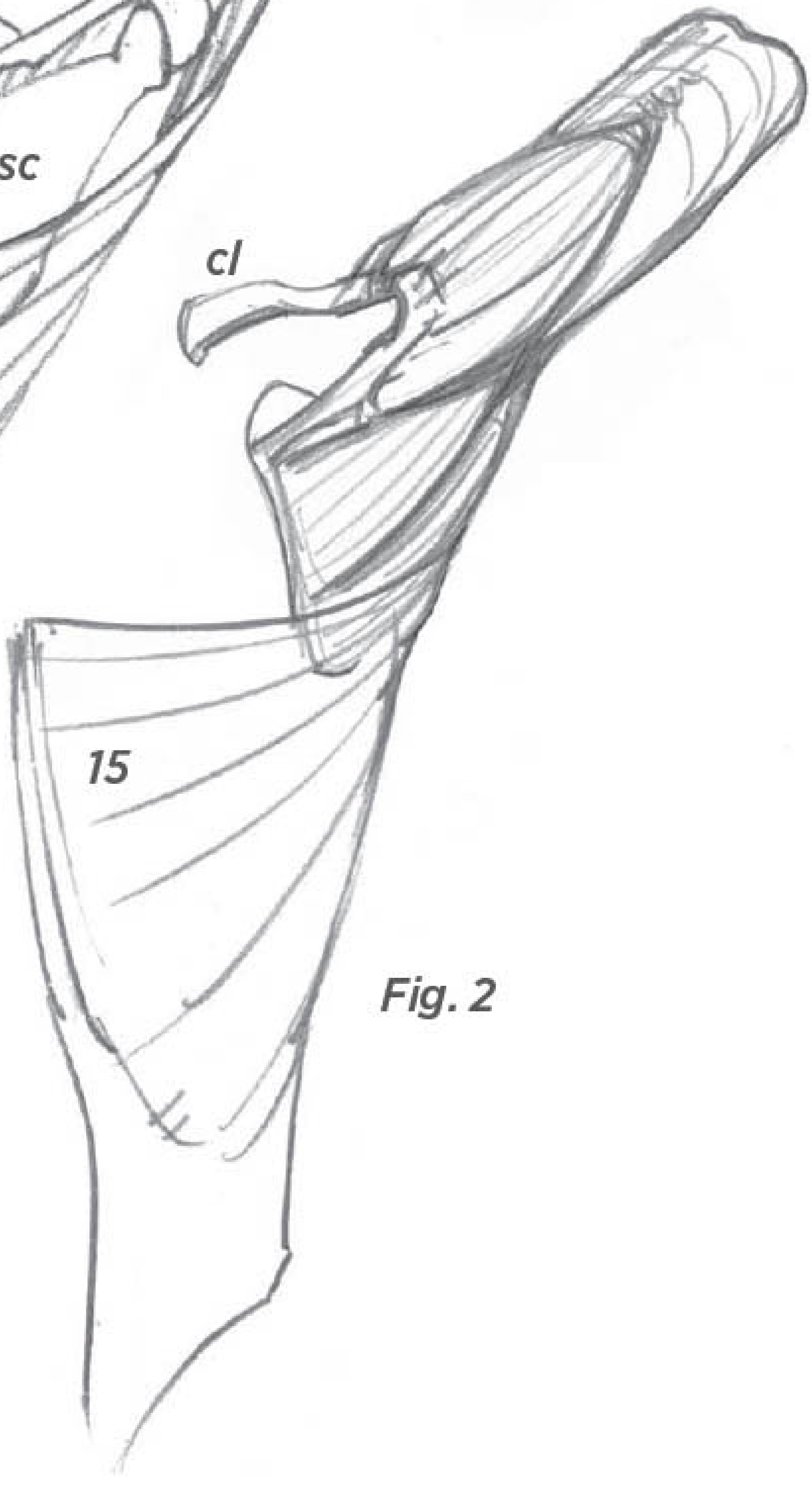
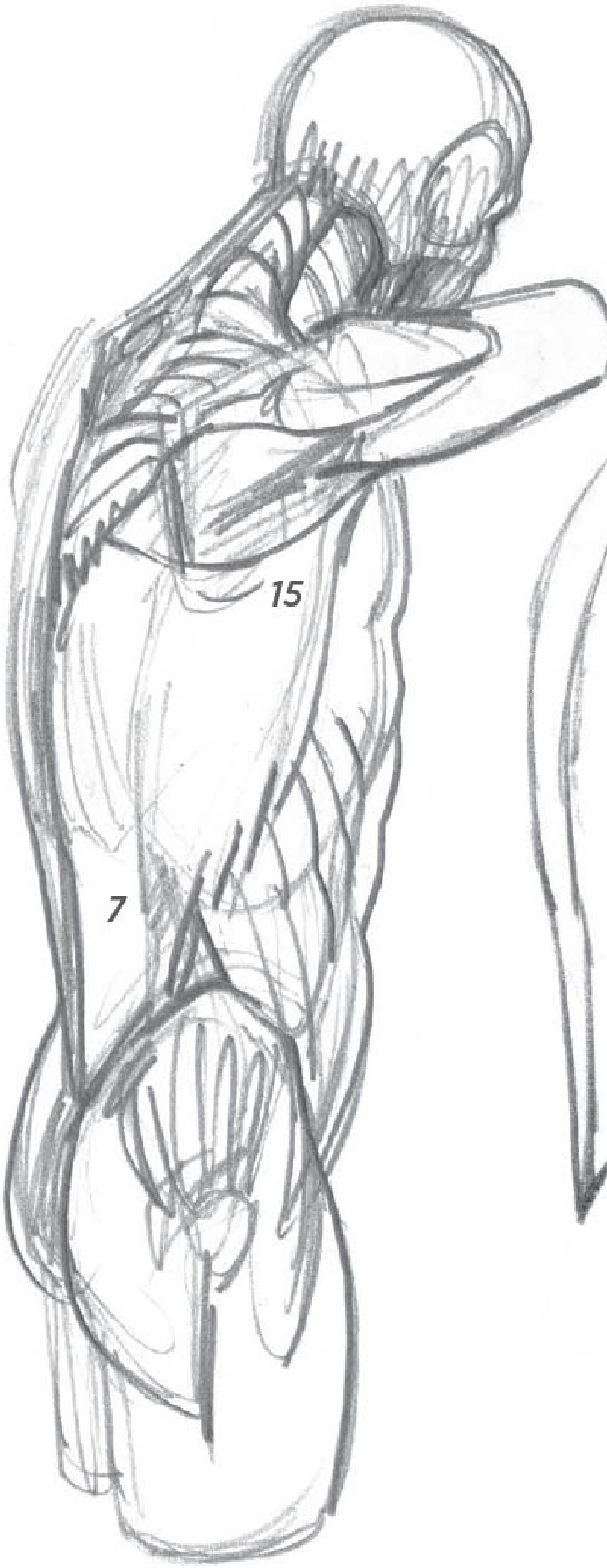


Fig. 2

Figs. 1 *and* ***2:*** *The latissimus dorsi (15) wraps around the teres major (14) and attaches to the humerus (hum).*



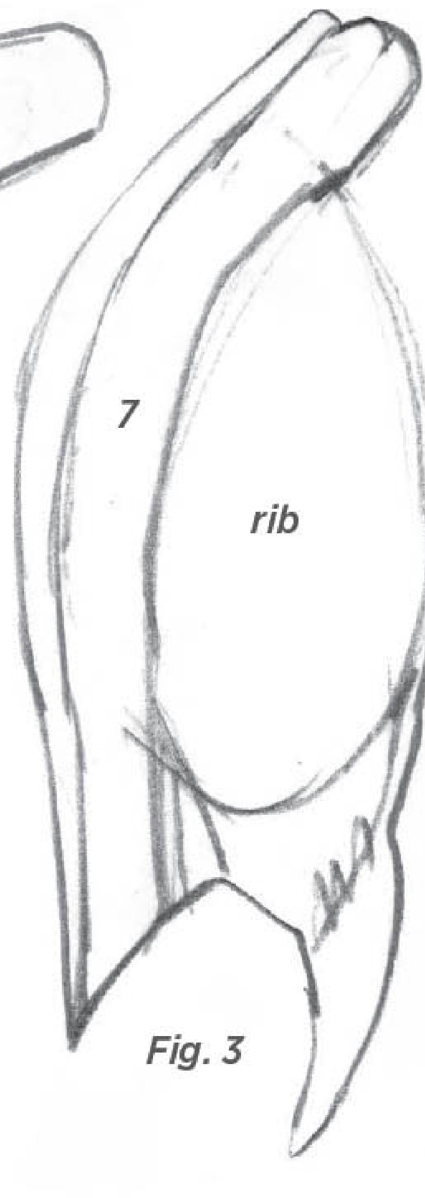


Fig. 3

Fig. 3: *Bony core (rib) and deep muscles (7).*

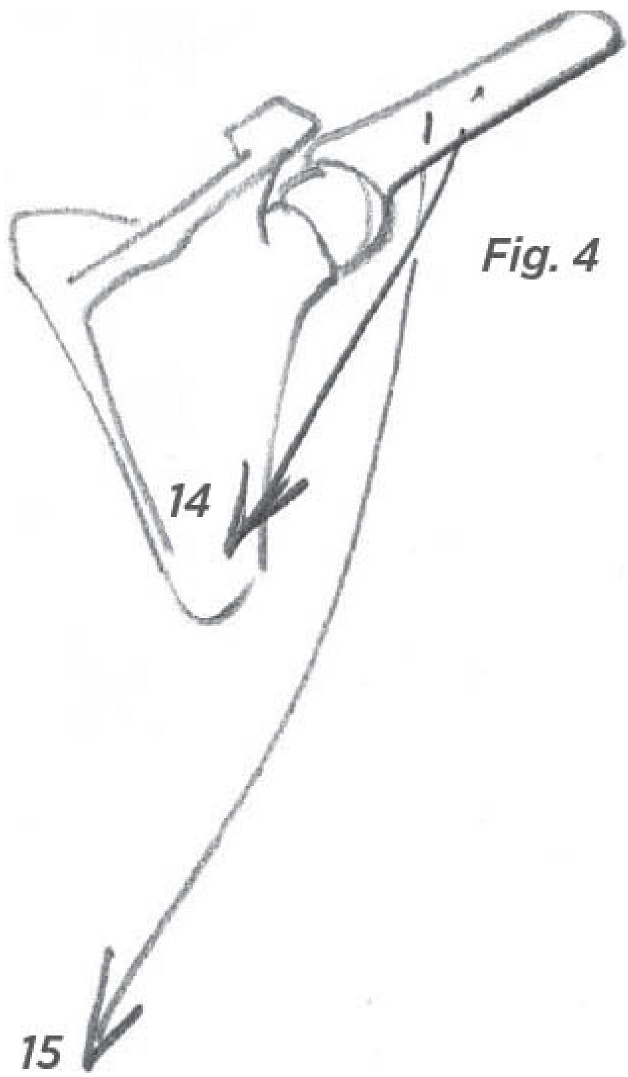
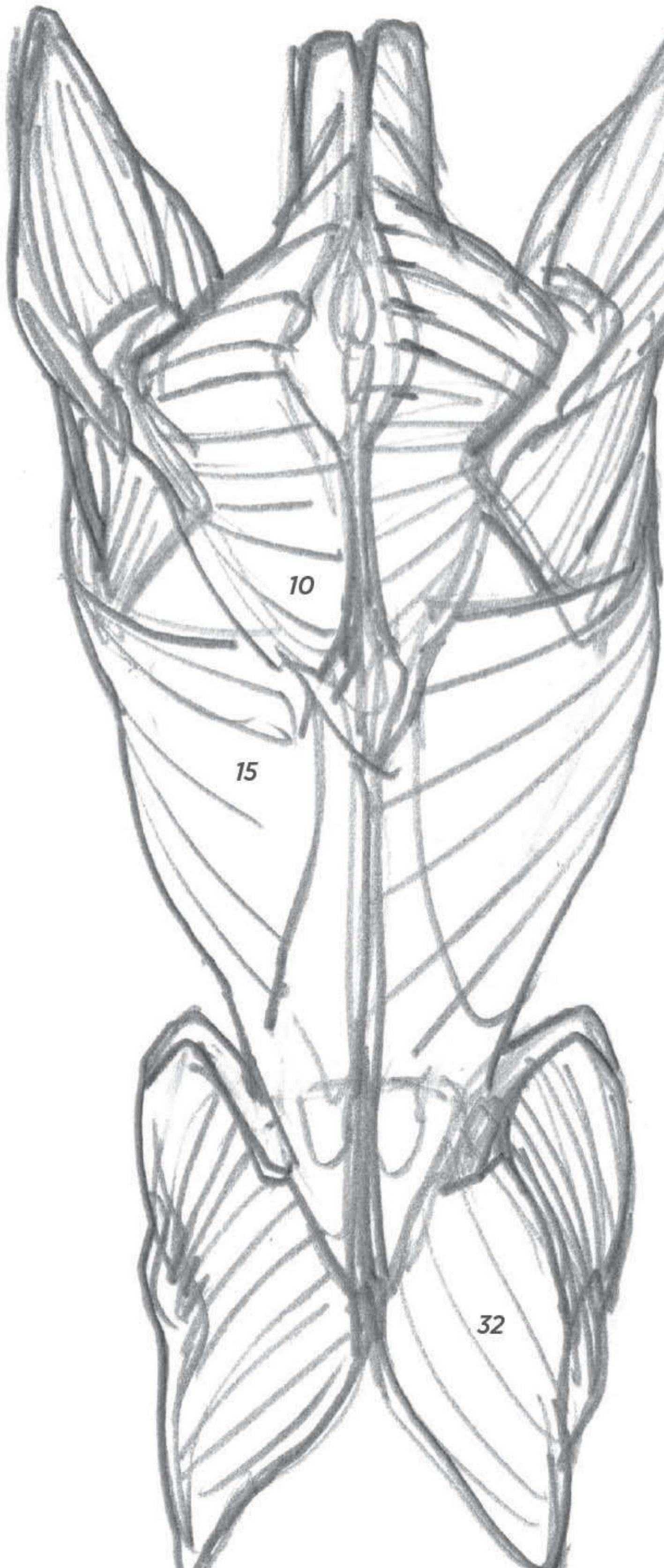


Fig. 4: *The teres major (14) is well placed for aiding in the lowering of the arm. It is supported by the latissimus dorsi (15).*



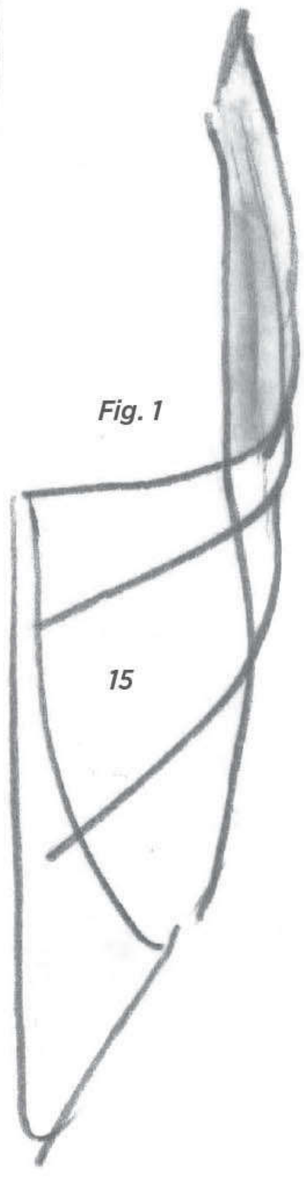
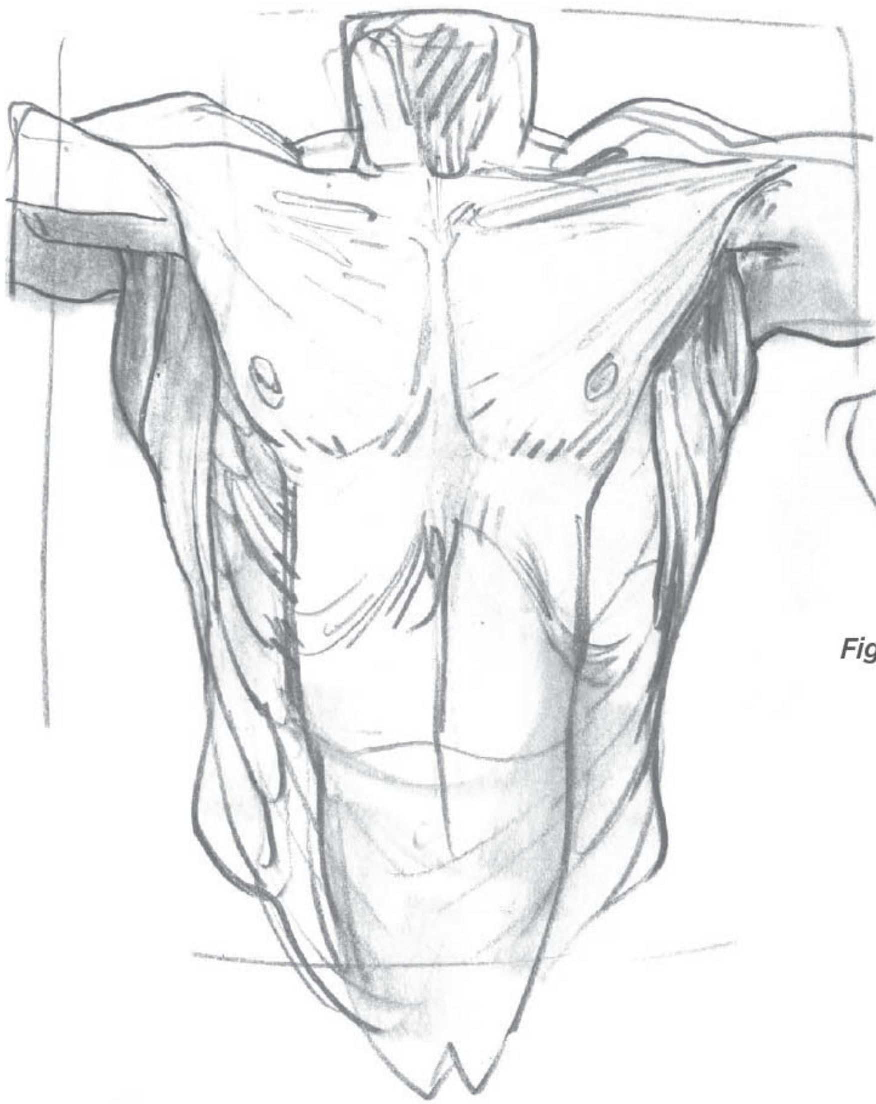


Fig. 1

Fig. 1: *Detached latissimus dorsi (15). Rear view.*



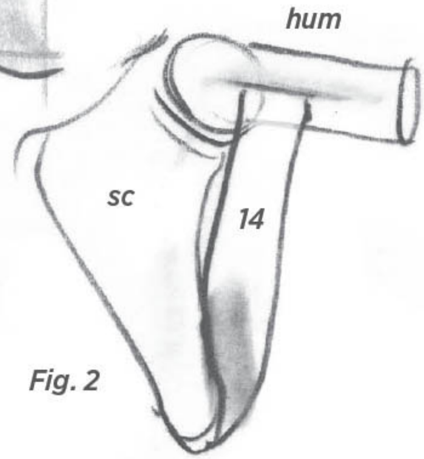


Fig. 2: *The scapula (sc) is shown from its inner (hidden) side. Here we can see the insertions of the teres major (14). From the inner side of the scapula (sc), it passes to the front of the humerus (hum).*

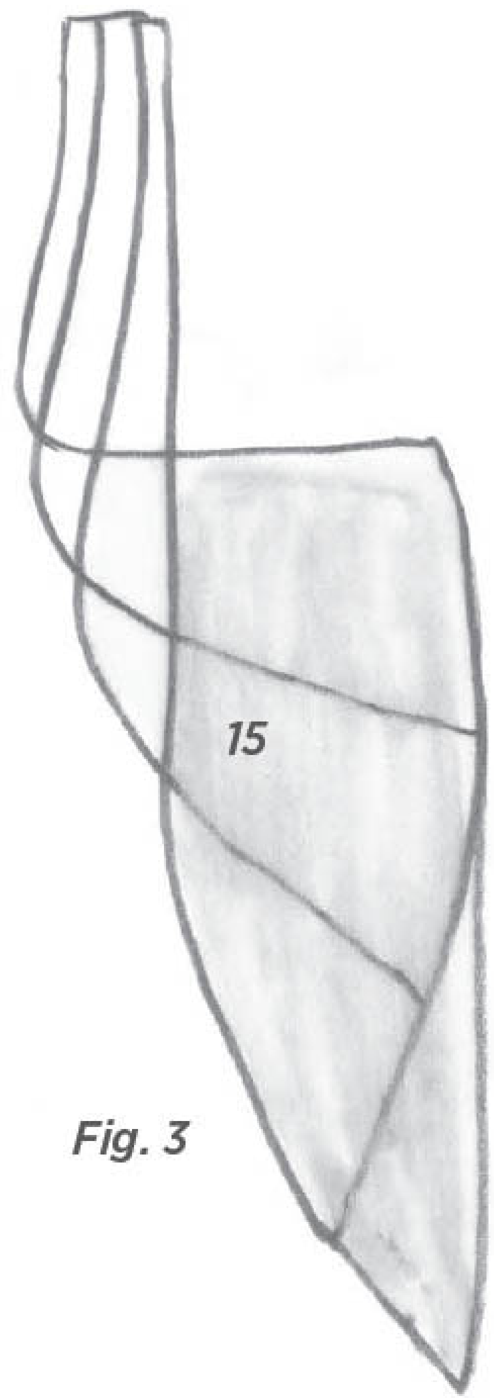


Fig. 3: *The latissimus dorsi (15) is shown detached from the body here, but it retains the shape that corresponds to the central drawing.*

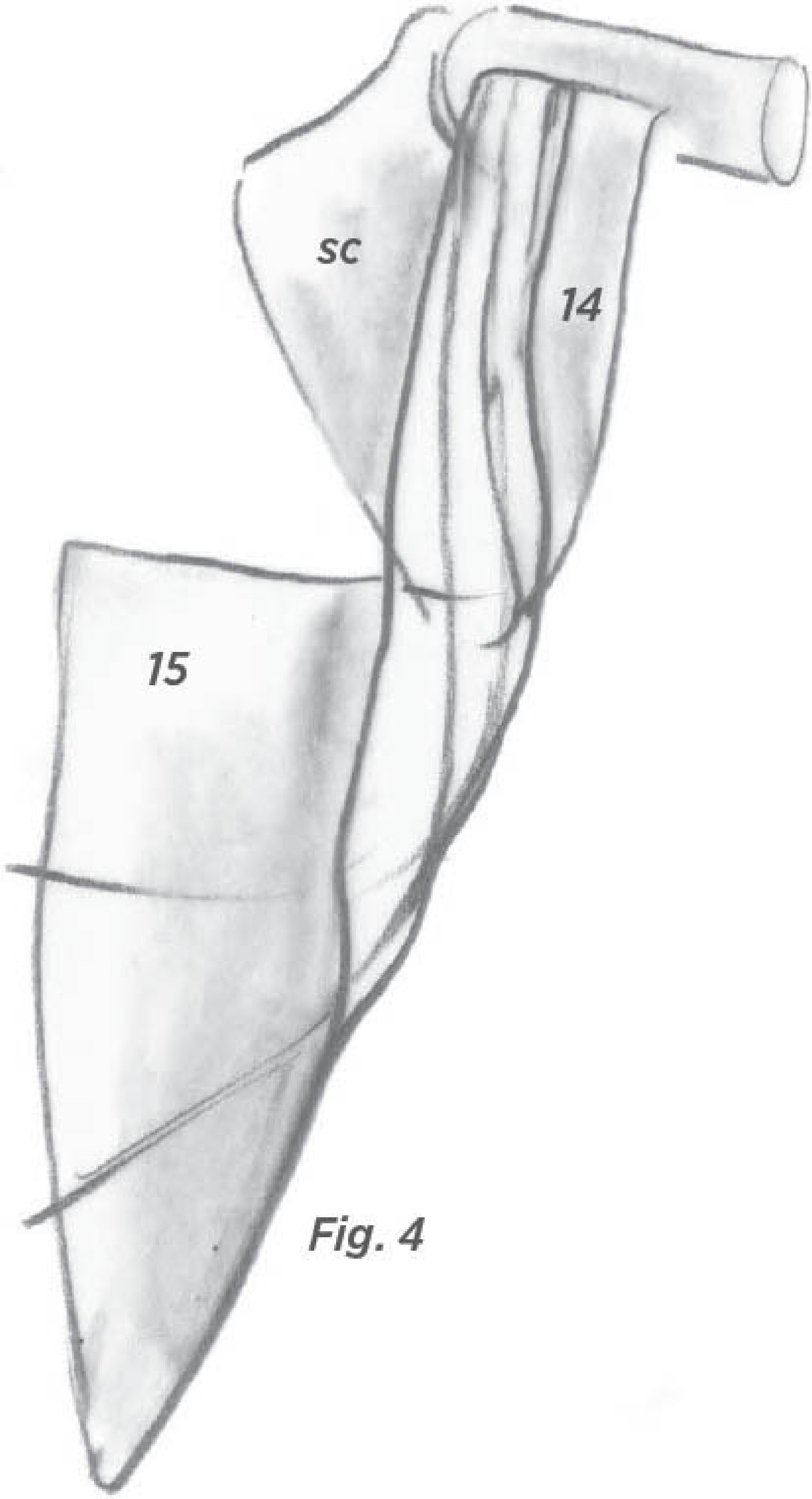


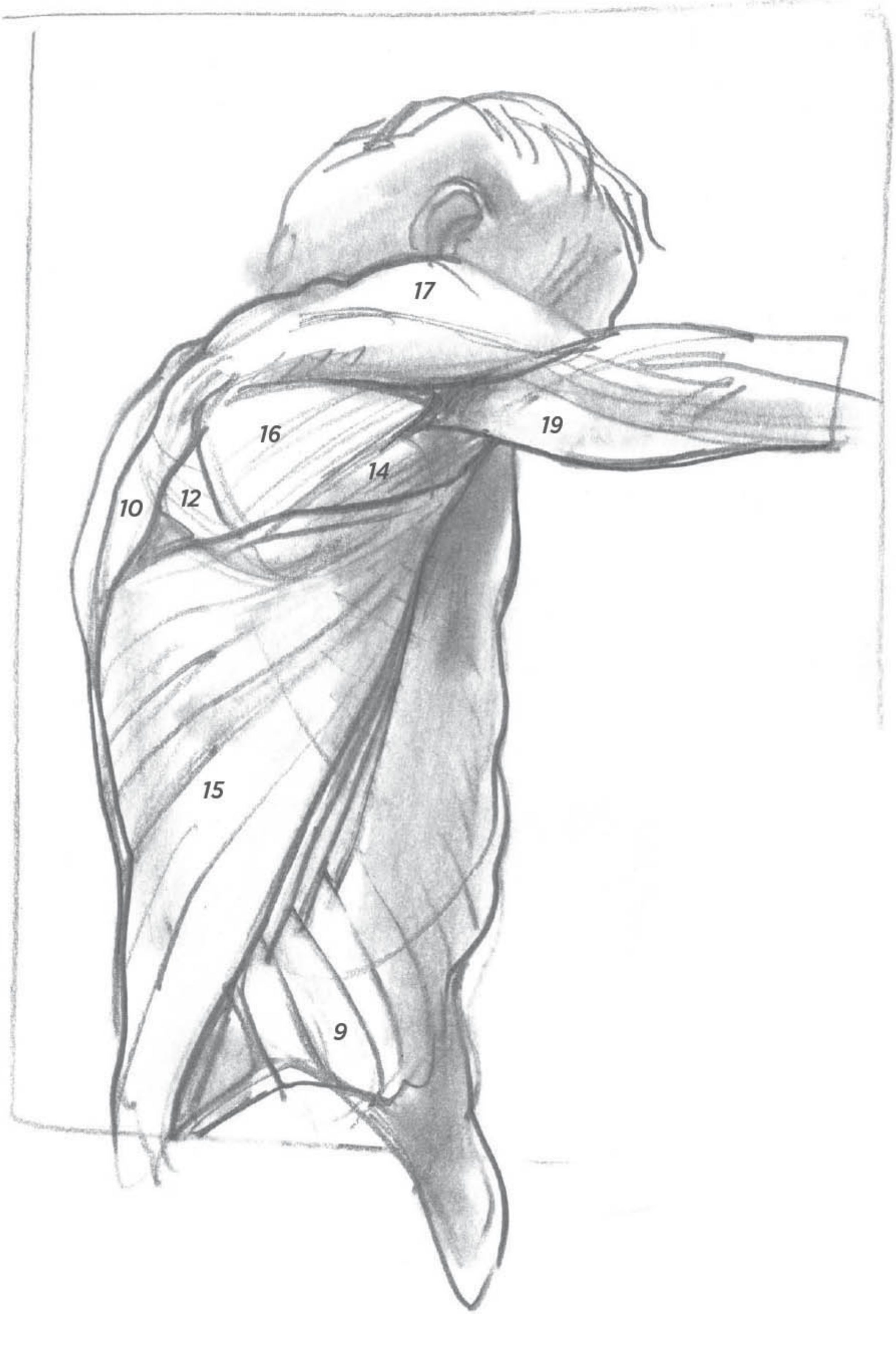
Fig. 4

Fig. 4: *Overlay of the teres major (14) and latissimus dorsi (15) muscles, as they might look if seen from the front but detached from the body.*


11
15
rib


7

On the two drawings on the facing page—just as one can often see on a living model—the latissimus dorsi also lets the deeper layers show through: the insertion of the serratus anterior (11) into the scapula, the spinal muscles (7), and the rib cage (rib).


17
16
19
14
10
12
15
9

This drawing shows the three side insertions of the latissimus dorsi.

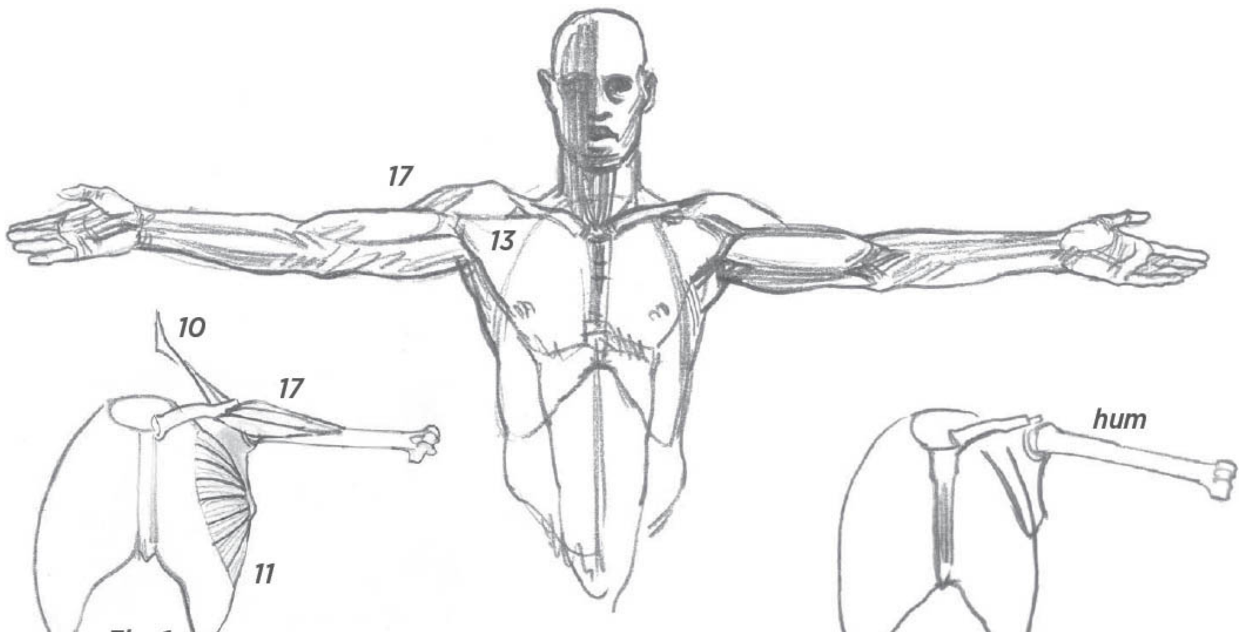


Fig. 1

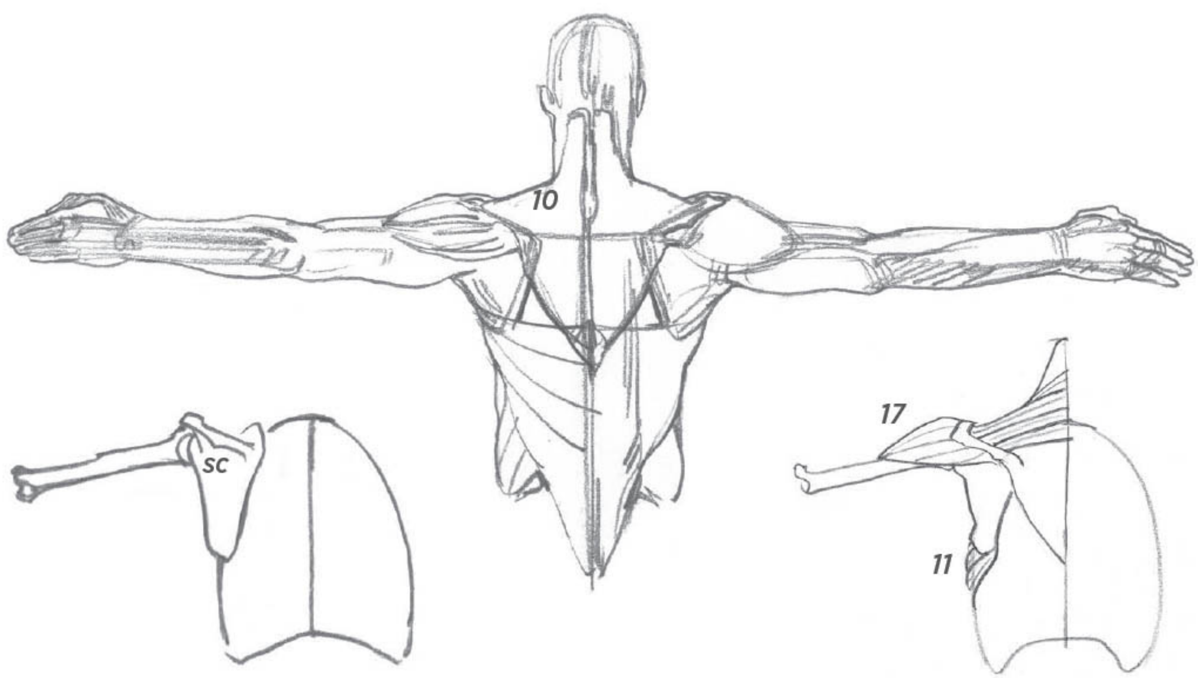
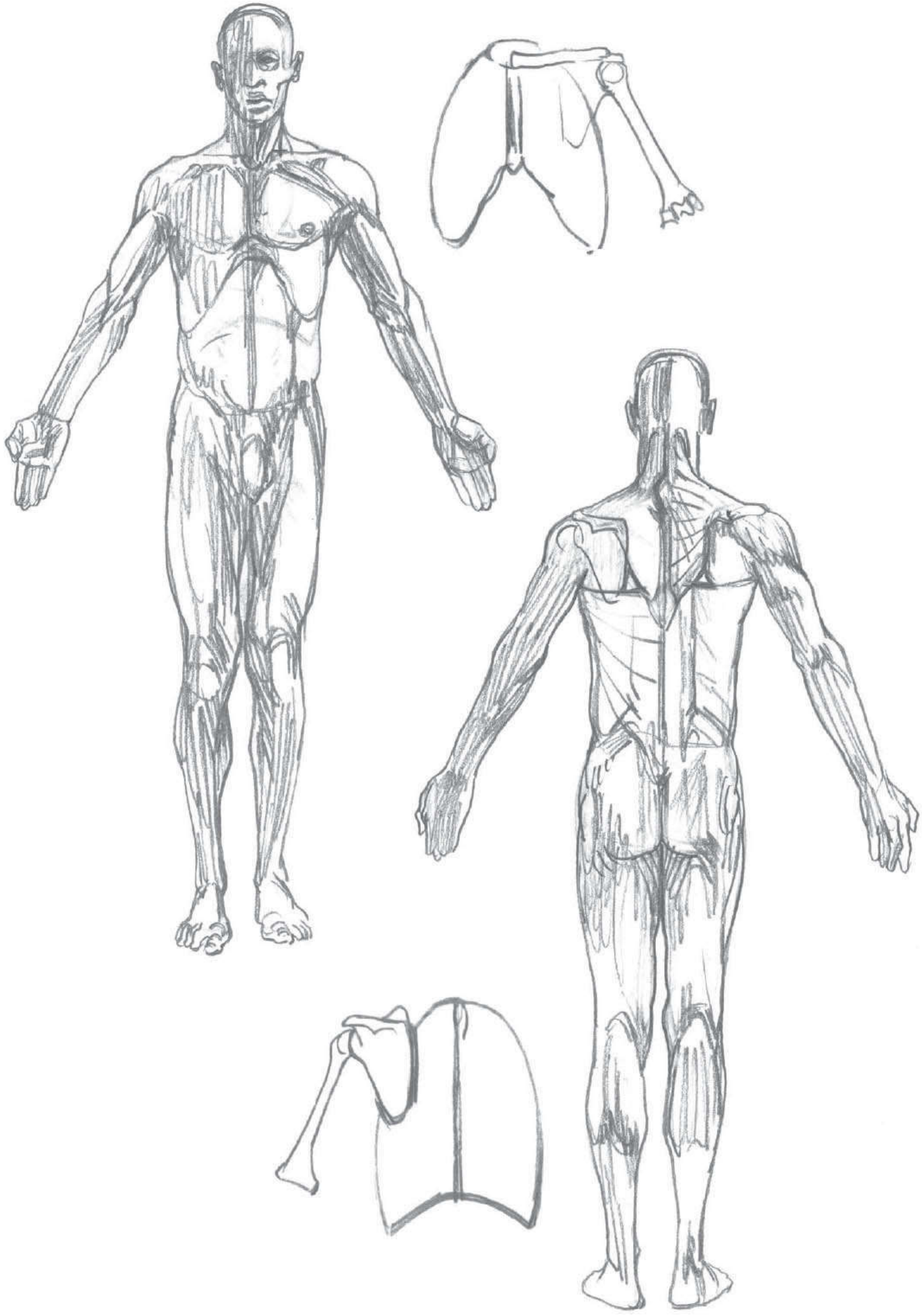


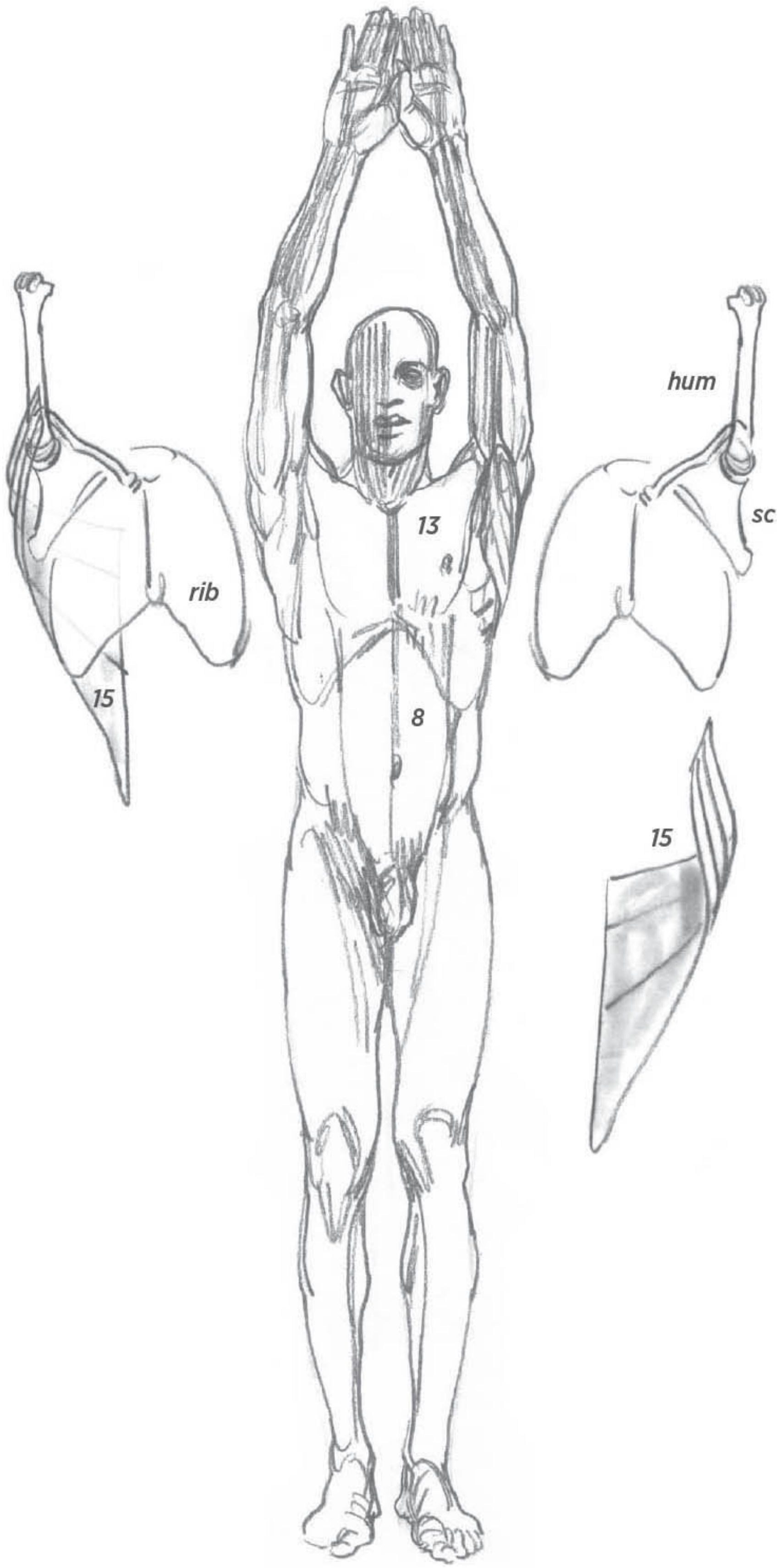
Fig. 2

If the scapula (sc) remained rigidly attached to the rib cage, we would not be able to lift our arm above the horizontal, at which point, the humerus (hum) presses up against the scapula. In order to lift the

arm into the vertical position, the scapula has to tilt and point upward. The elevating muscles of the upper limb are the trapezius (10) and the serratus anterior (11), which cause the scapula (sc) to tilt, whereas the deltoid (17), for its part, acts directly on the humerus (hum). The scapula begins tilting as soon as the movement begins.

Figs. 1 *and* ***2:*** *The three elevating muscles*.





hum
13
sc
rib
15
8
15

Lifting the arm involves tilting the scapula (sc). The latissimus dorsi (15) occupies the rear wall of the armpit. It wraps around the tip of the scapula and around the teres major, which it largely covers and with which it merges at this level.

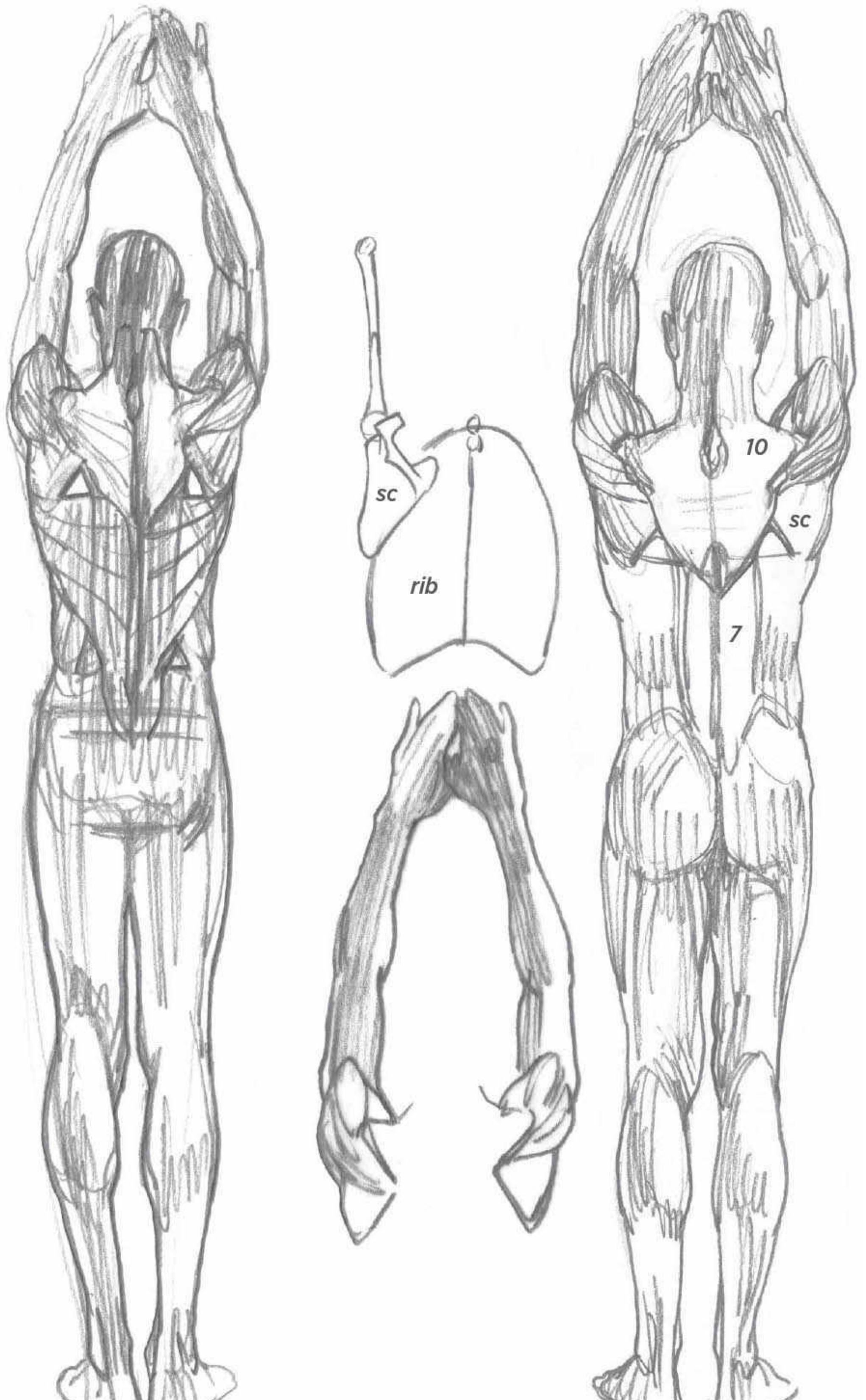
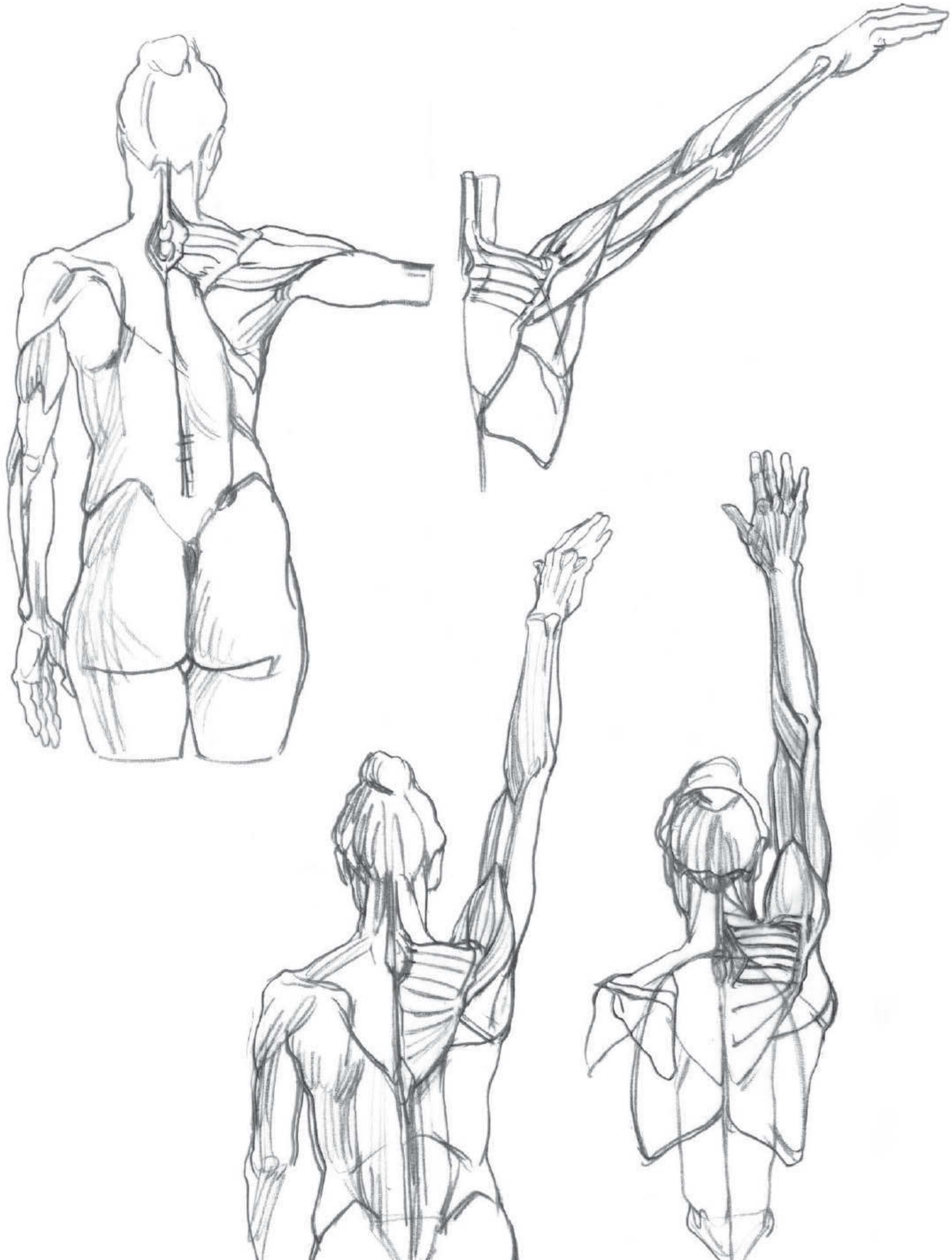

sc
rib
10
sc
7

Fig. 1

Fig. 1: *The three elevating muscles: the trapezius (10), the deltoid (17), and the serratus anterior (11).*



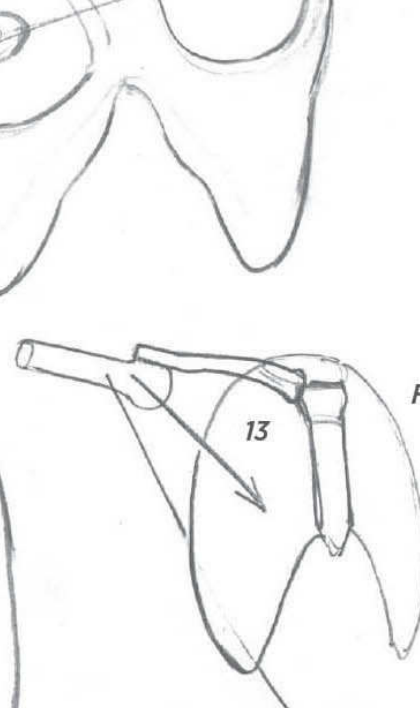


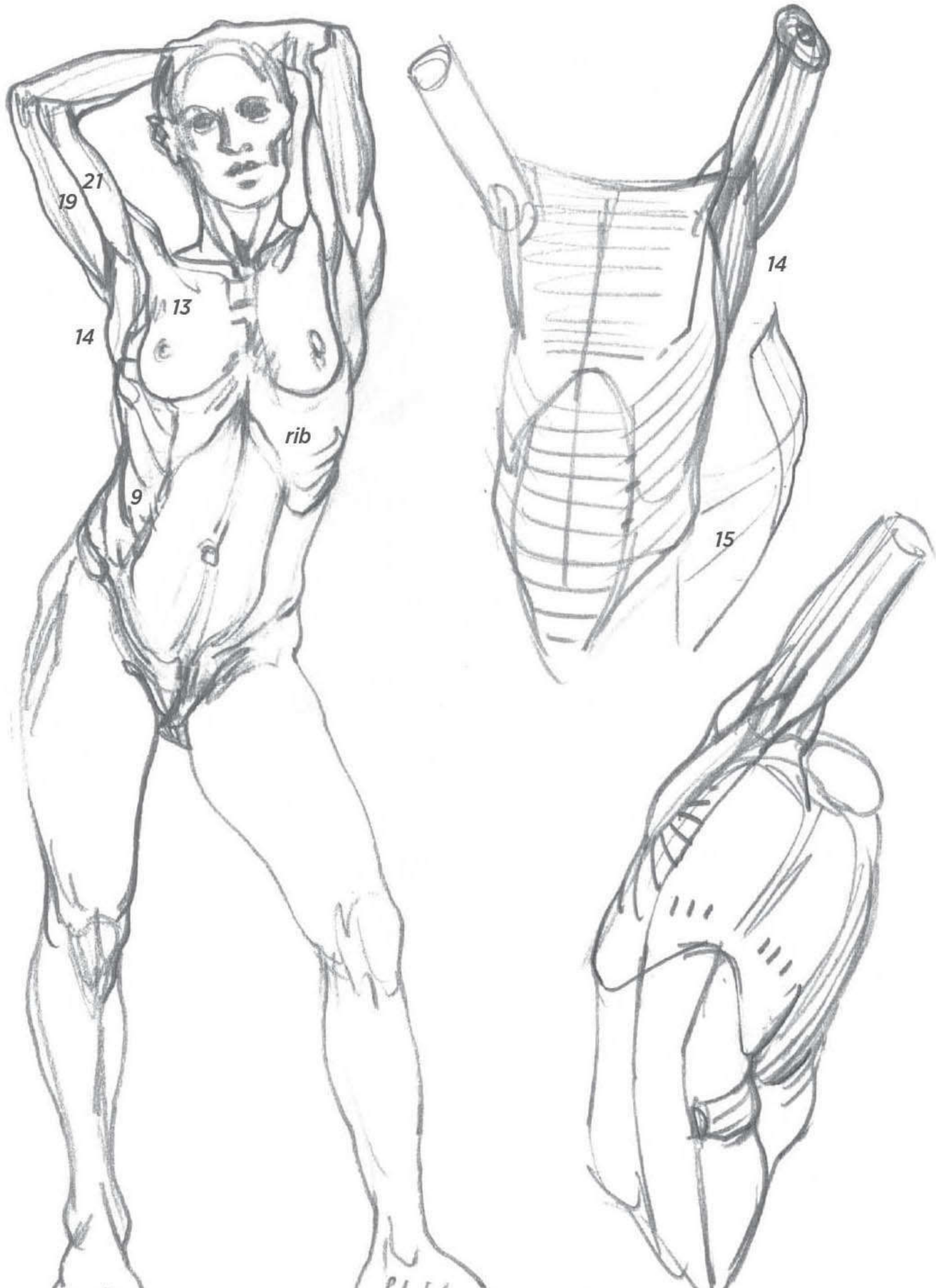
Fig. 1

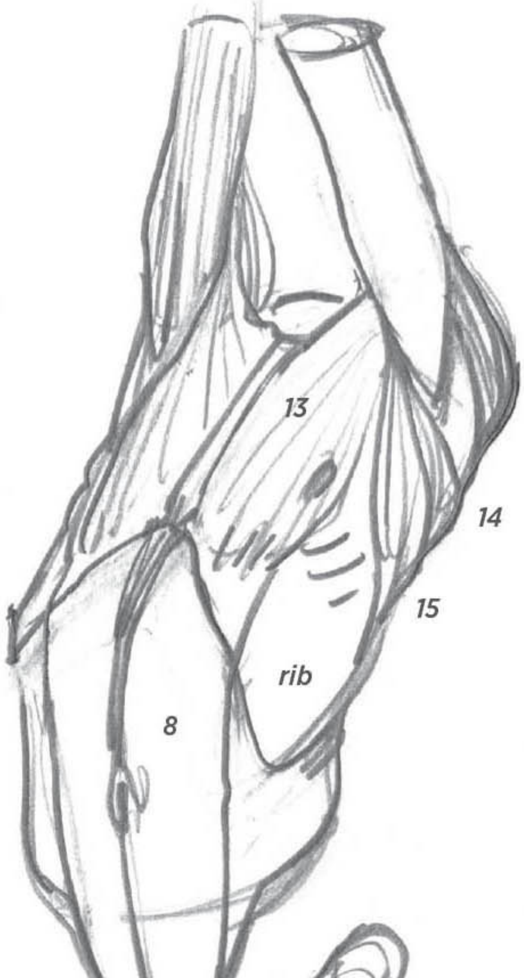
The teres major (14) and latissimus dorsi (15), together, form the rear wall of the armpit. It is difficult to tell them apart at this level.

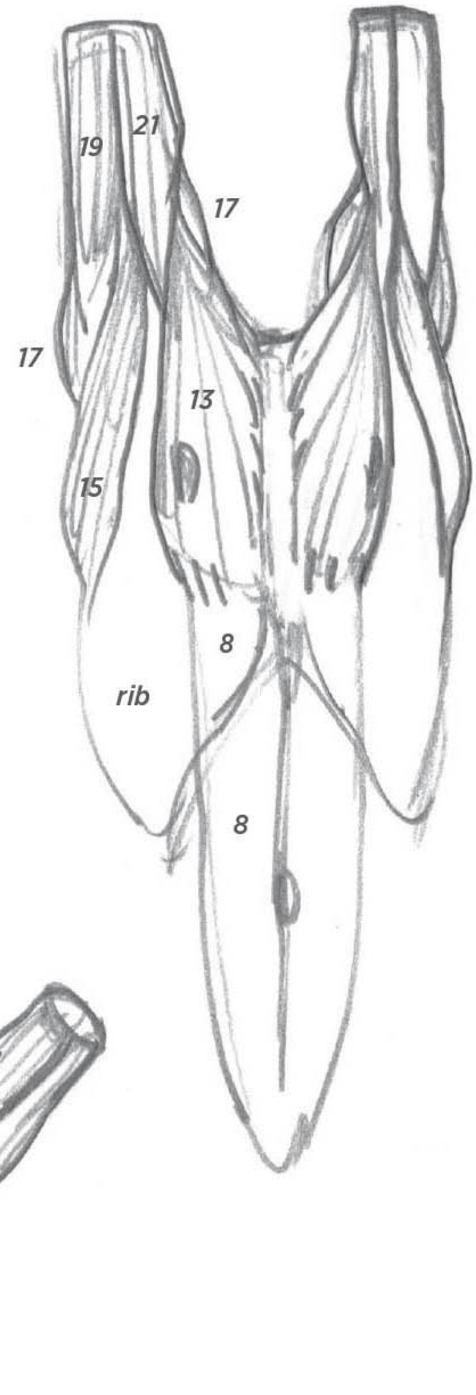
Fig. 2

The hollow of the armpit is delimited by the rib cage (rib) and by the two walls formed by the pectoral (13) in the front, the teres major (14) in the back, and the latissimus dorsi (15) combined.

***Figs. 1** and **2:** The three lowering muscles: the pectoral (13), the teres major (14), and the latissimus dorsi (15).*

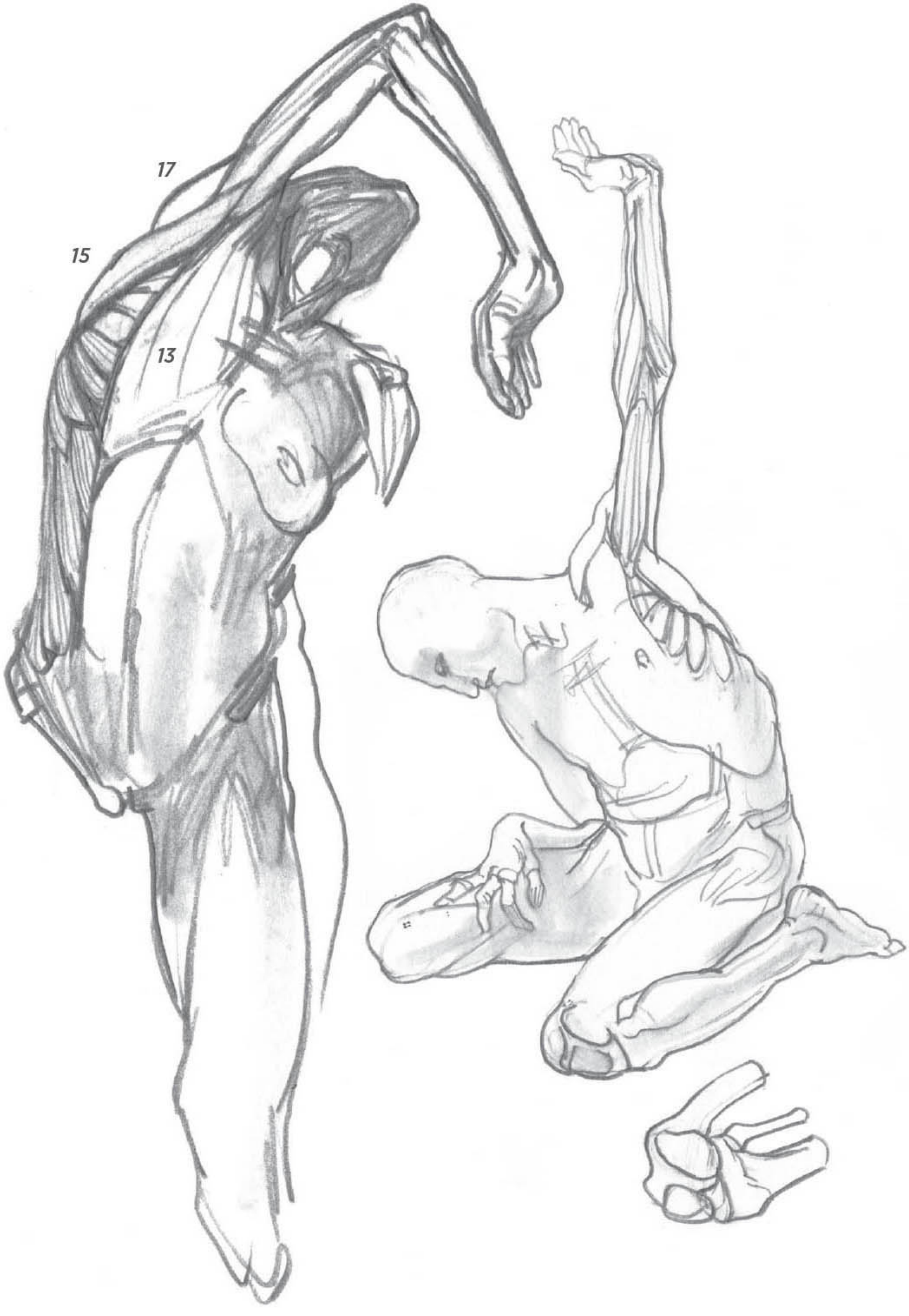

21
19
13
14
rib
9
14
15


13
14
15
rib
8


19
21
17
17
13
15
8
rib
8


13
15
11

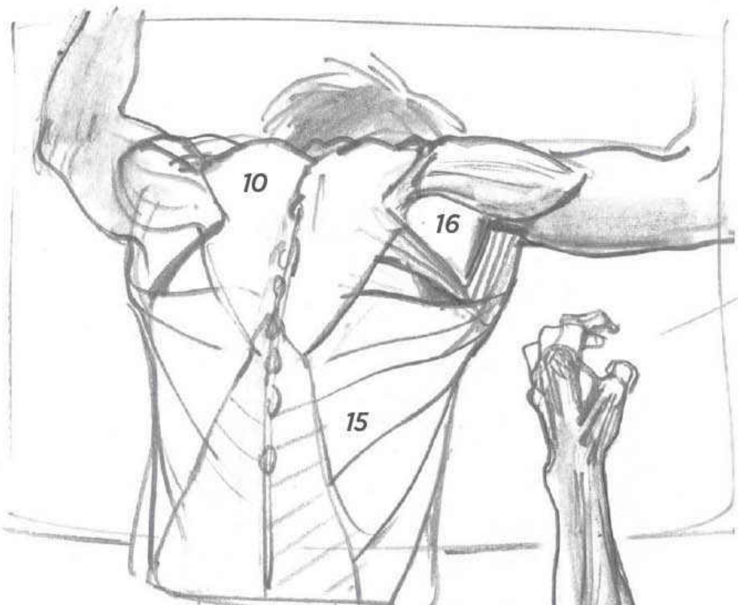
The muscular system for lowering the arm is located in the walls of the armpit. These are the pectoral (13), teres major (14), and latissimus dorsi (15) muscles.

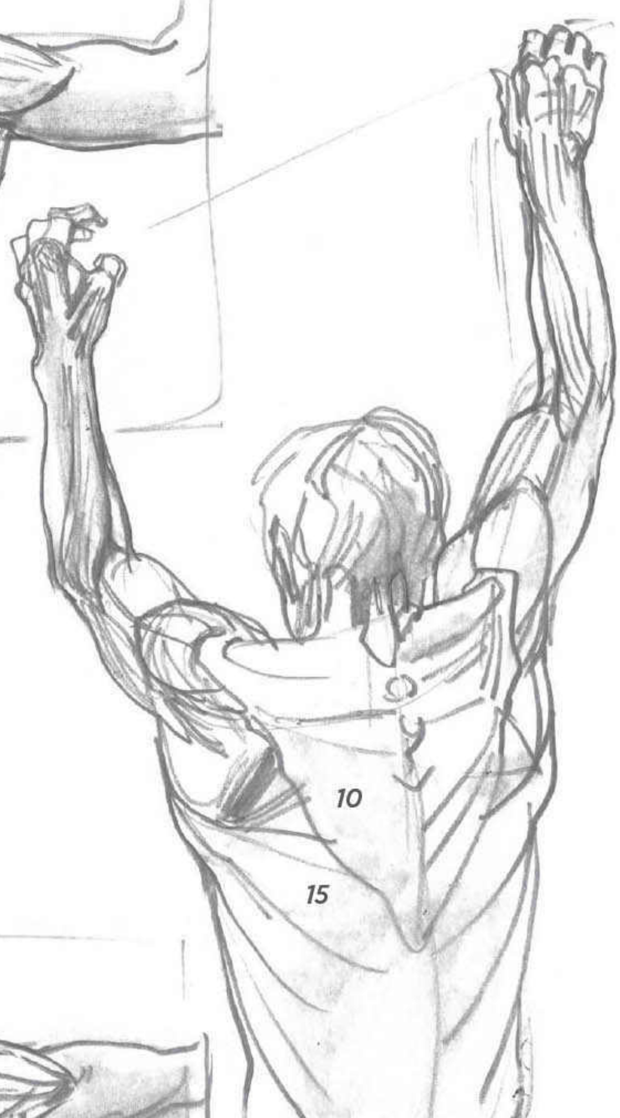

17
15
13

21
19
13
15

21
19
13
15

Connections between the arm and torso: *The two walls of the armpit (13 and 15) alternate with the two principal muscles of the arm (21 and 19).*
Pectoral (13) / biceps (21) / latissimus dorsi (15) / triceps (19).


10
16
15


10
15

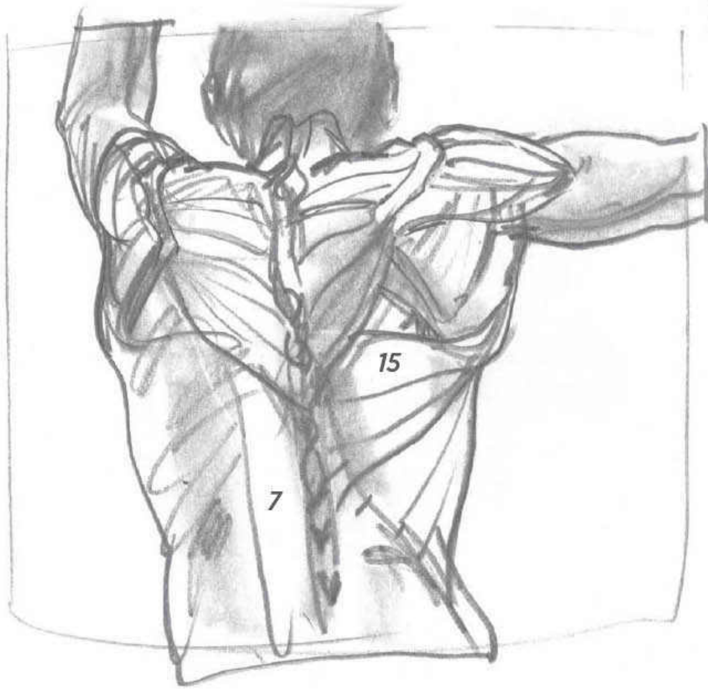
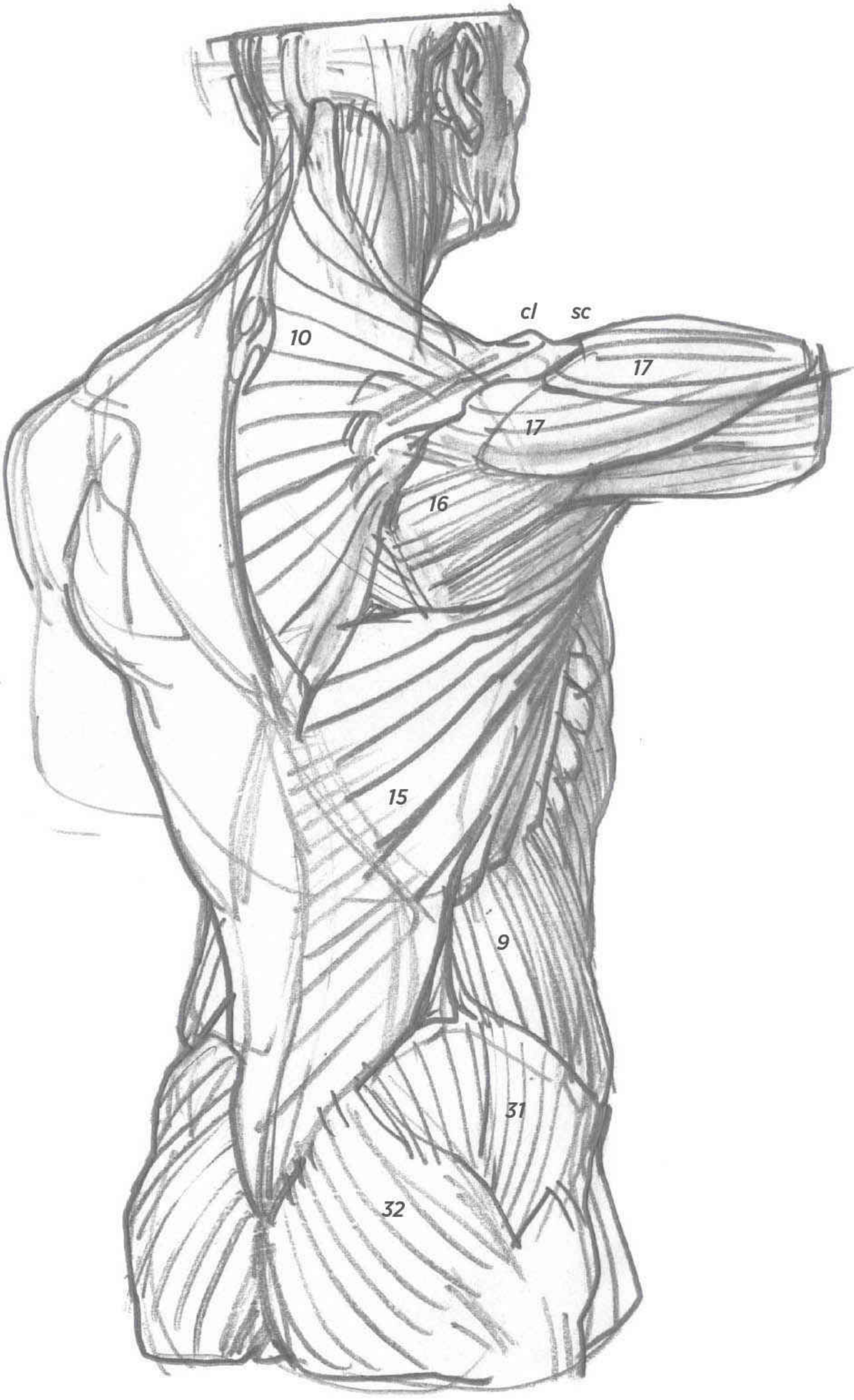
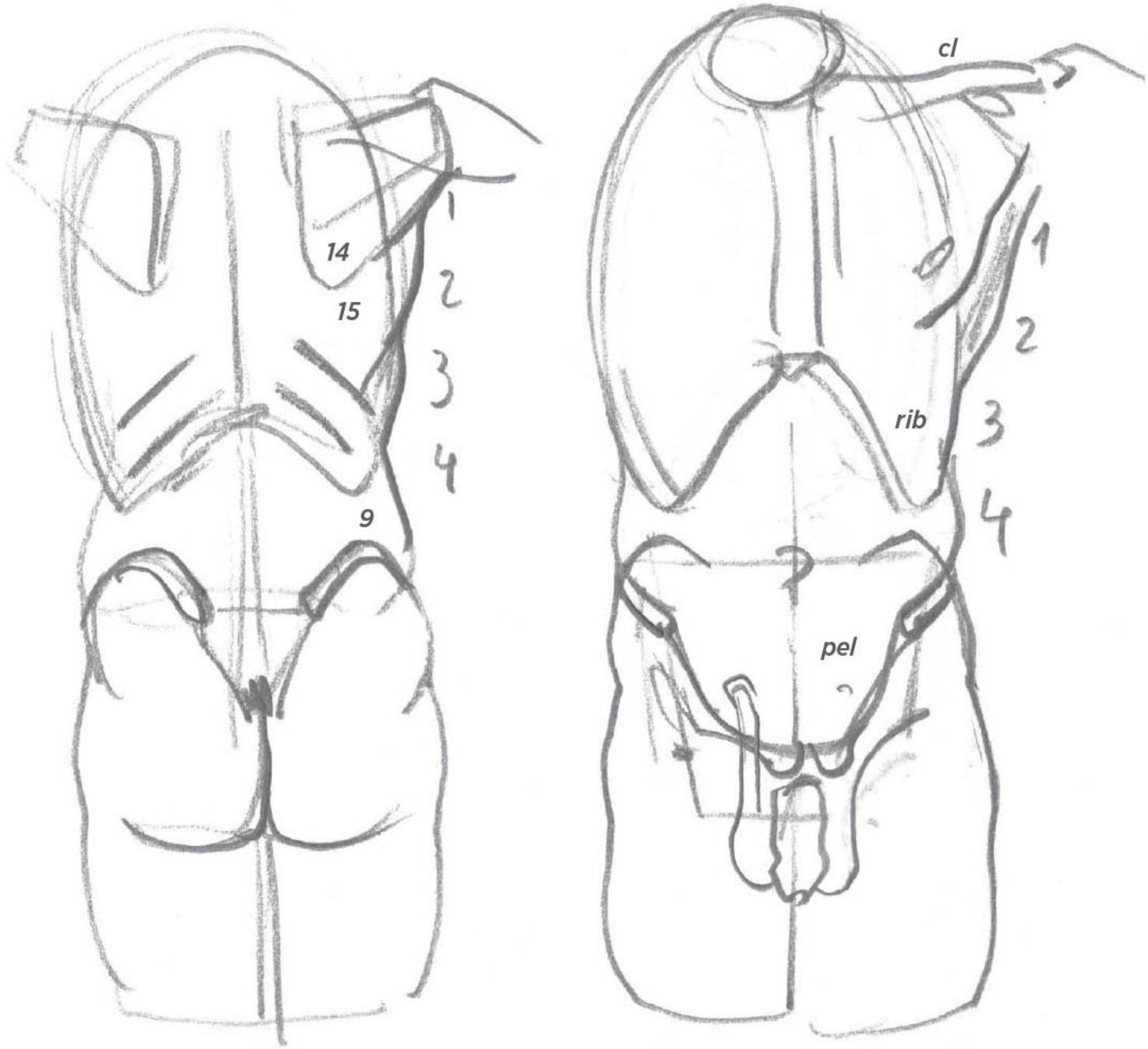

15
7

Fig. 1: *The lowering muscles of the arm—here the teres major (14) and latissimus dorsi (15) (with which one can also connect the pectoral, 13, in a frontal view)—are powerful muscles that make it possible to climb using the strength of the arms*.

Fig. 1

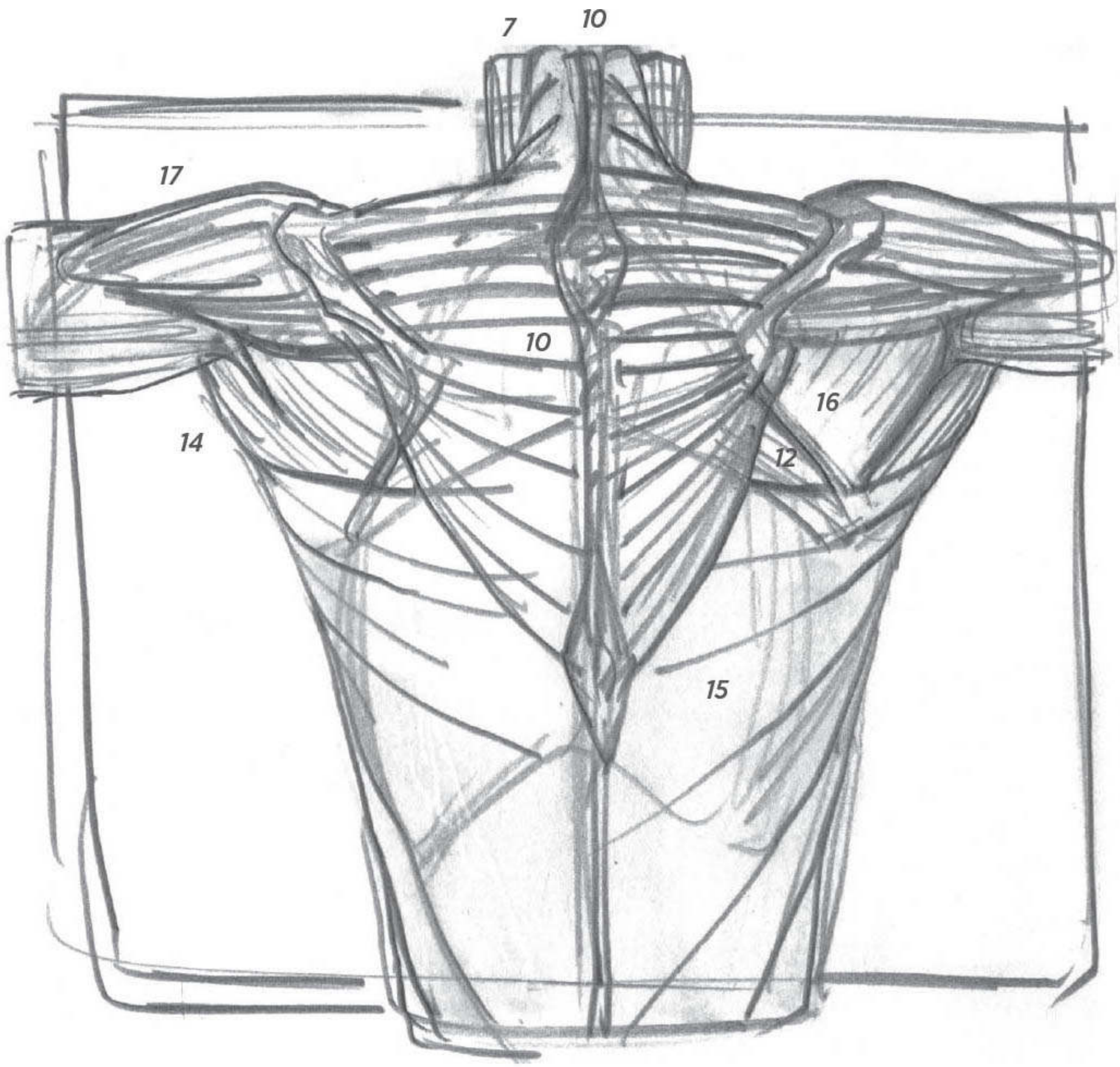

cl
sc
10
17
17
16
15
9
31
32



The various convexities (handwritten 1, 2, 3, 4) on the contour of the torso, from the armpit to the pelvis, correspond to the teres major (14), the latissimus dorsi (15), the rib cage (rib), and the large oblique (9). On a less muscular person, the latissimus dorsi will be less defined, the teres major and latissimus dorsi will tend to merge, and the rib cage will be visible from a greater distance.

As for body fat, it will tend to add to the volume of the large oblique muscle. It thus accentuates the convexity of the flank when the flank remains situated above the pelvis (a more masculine shape), but can also mask this bone reference and merge with the fat of the buttocks and the hip. In that case, the waist effect will be reinforced (a more

feminine shape).



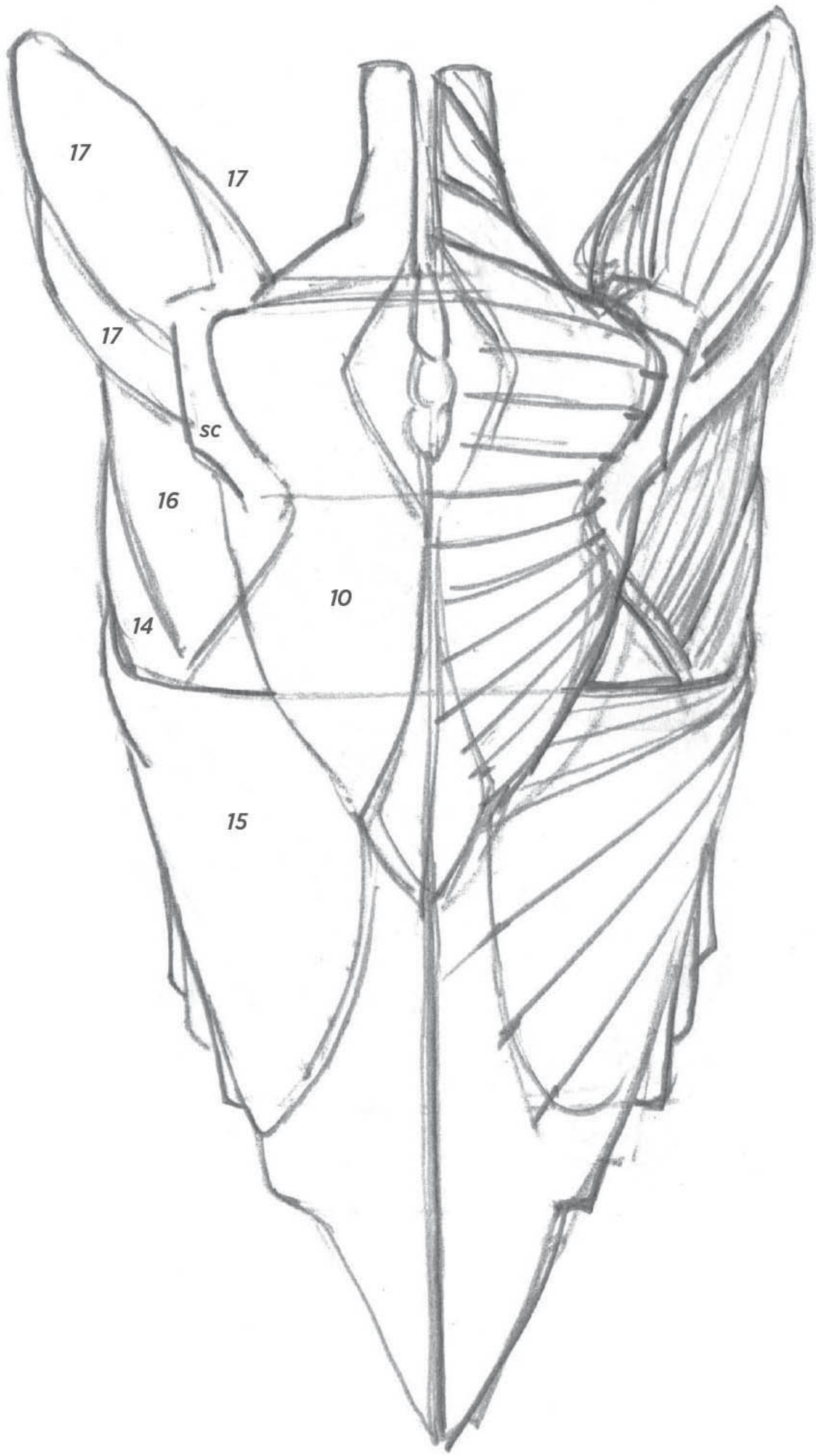
Functionally speaking, the musculature that is proper to the torso—that is to say, the muscles that make it possible for the rib cage to move with respect to the pelvis—include the spinal muscles, the rectus abdominis muscles, and the large obliques (i.e., all the abdominal muscles).

The musculature of the upper limb—again, speaking purely in terms of function—begins with the trapezius (10), rhomboid (12), teres major (14), latissimus dorsi (15), infraspinatus (16), and deltoid (17) muscles, as well as the serratus anterior (11) and pectoral (13) muscles, visible from the front. The musculature of the upper limb is

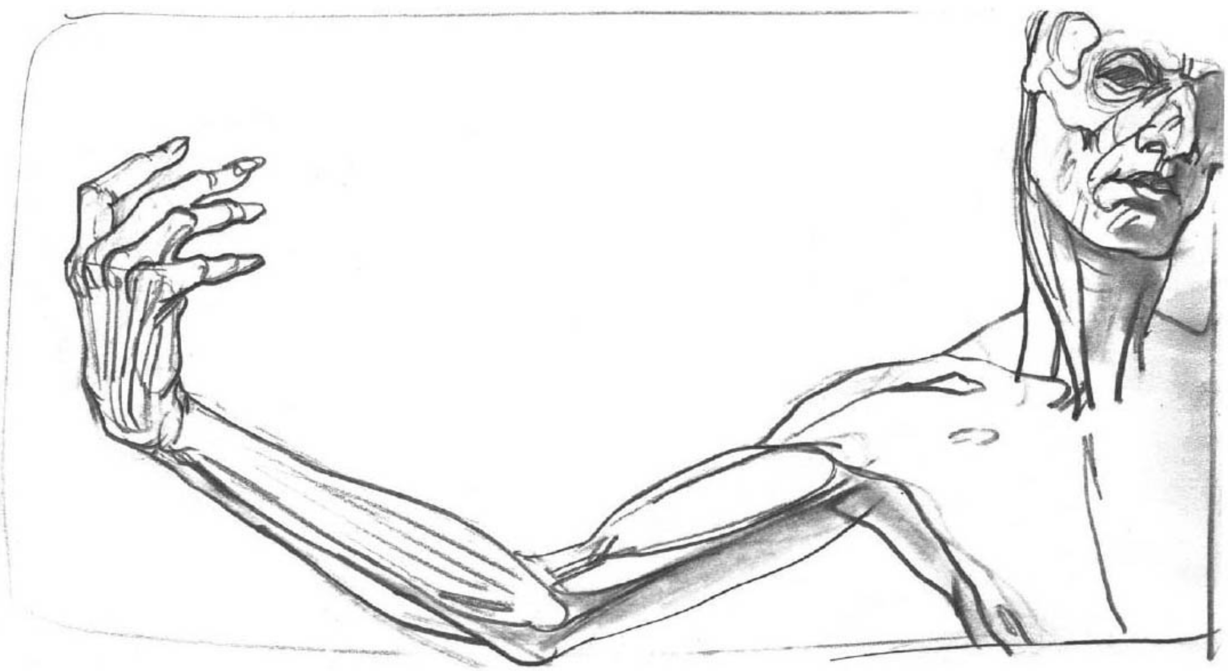
extremely extensive and covers the entire back, from the skull to the sacrum. This is justified by the wide range of movements it controls.


10
15
7
7

Here, we see most of the muscles that can be seen along the back belong, in terms of mechanics, to the upper limb. The trapezius (10), the serratus anterior (visible from the front), and the deltoid (17) serve to lift the arm, whereas the teres major (14), latissimus dorsi (15), and pectoral (visible from the front) serve to lower it. In this drawing, one can see the spinal muscles (7) underneath the latissimus dorsi (15) as they appear most often. Indeed, even though these are deep muscles, their outline can be seen underneath the veil formed by the latissimus dorsi.



17
17
17
sc
16
10
14
15



upper limb

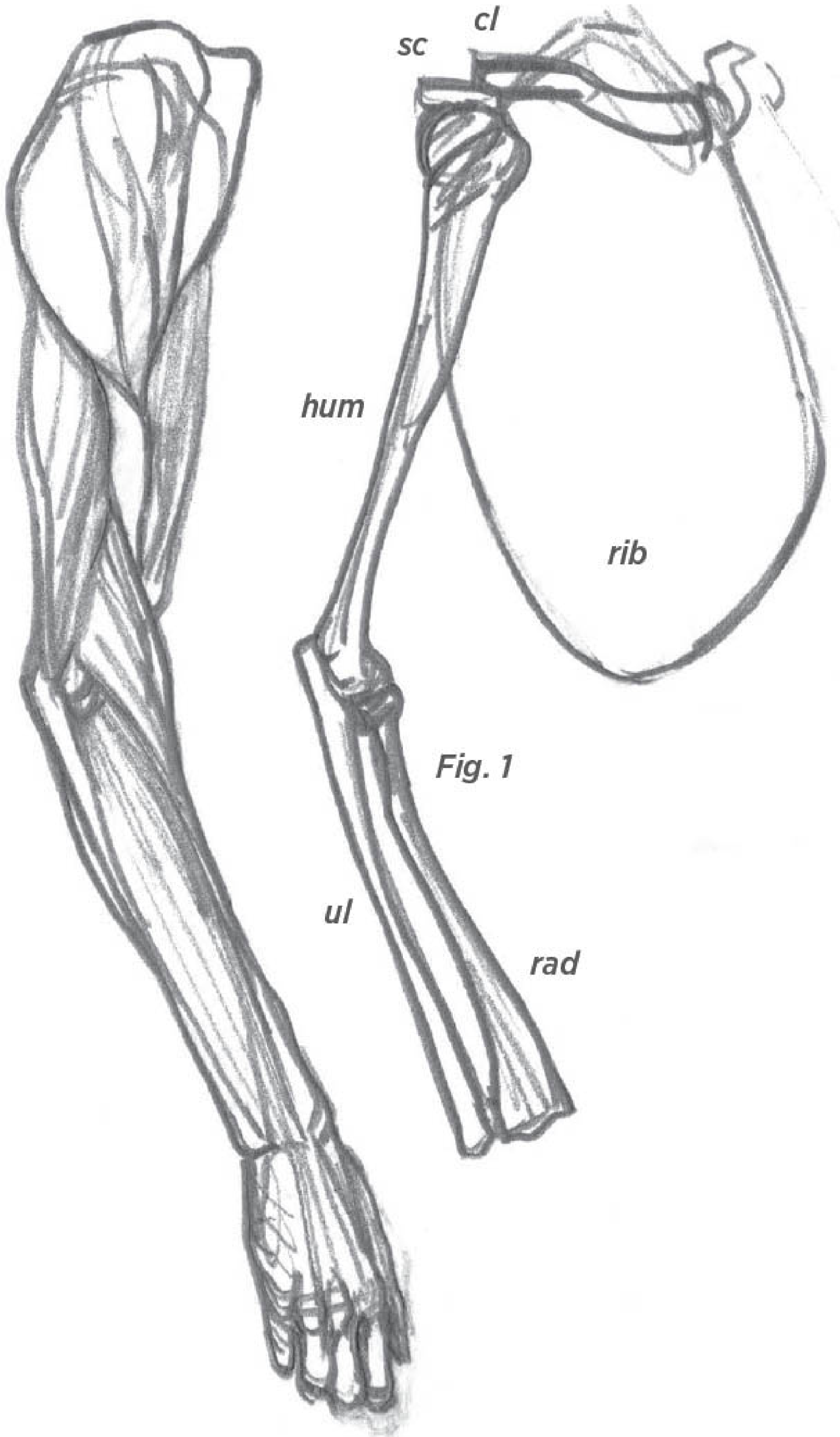


Fig. 1

Fig. 1: *There is one bone, the humerus (hum) for the upper arm. There are two bones for the forearm: the radius (rad) and the ulna (ul). This last bone is subcutaneous and creates the tip of the elbow (the olecranon).*

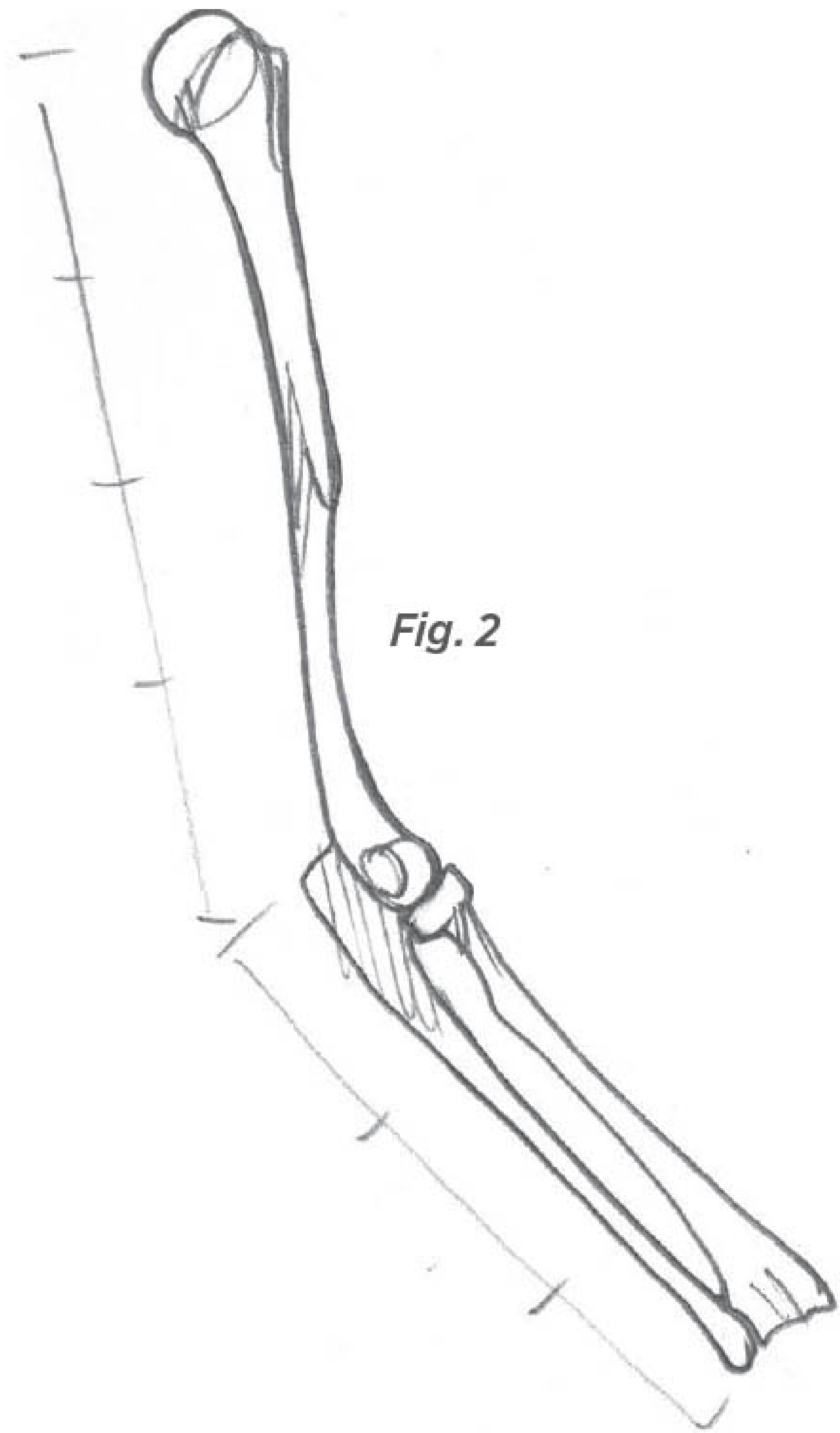


Fig. 2: *Proportions. The radius and the ulna are three quarters the length of the humerus.*

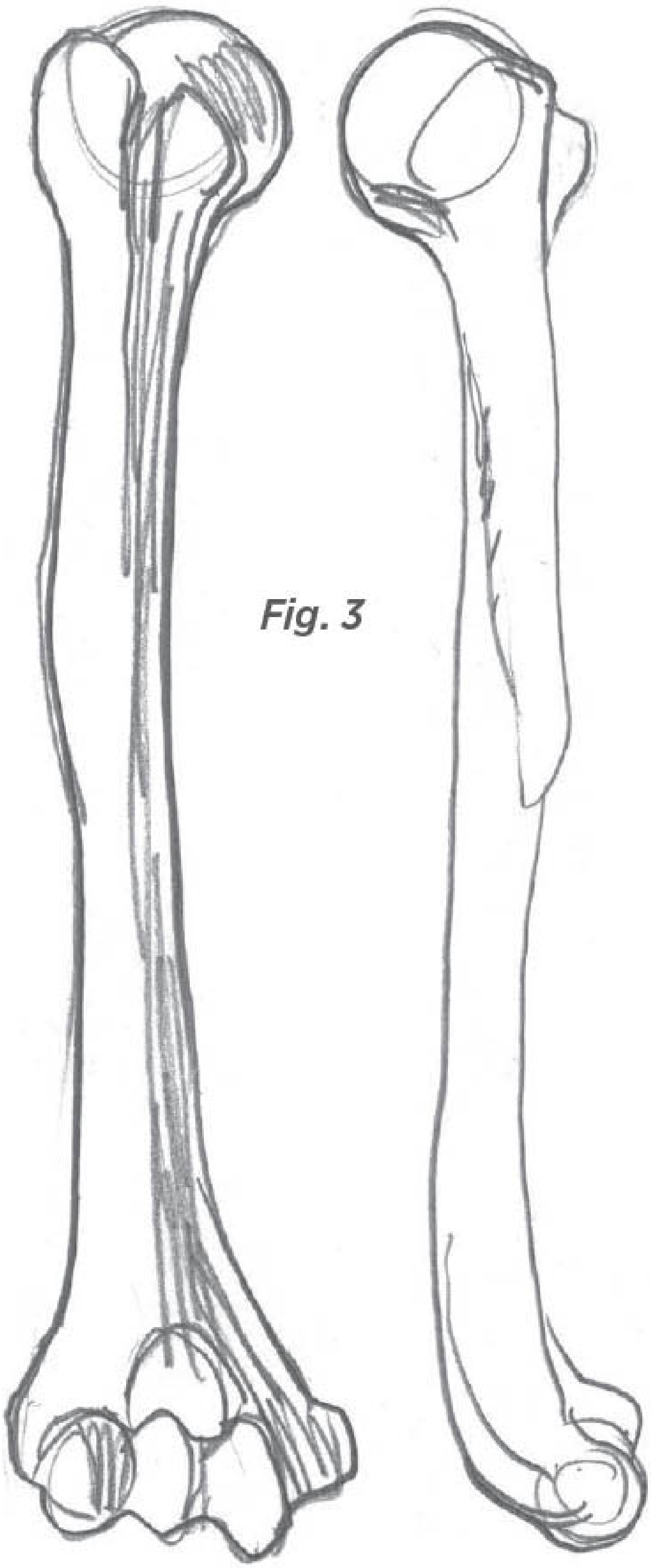


Fig. 3

Fig. 3: *The humerus (hum), seen from the front and in profile.*

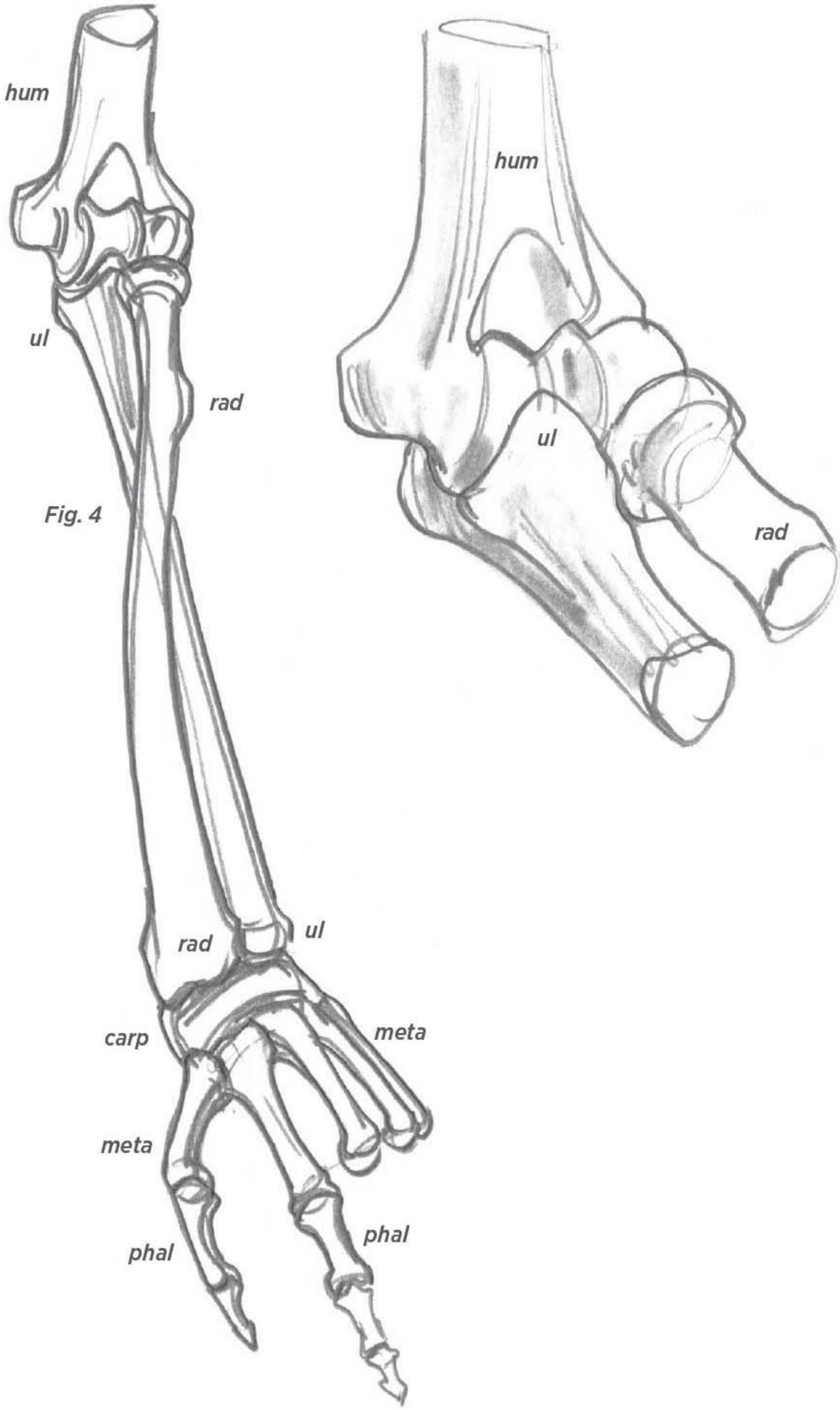


Fig. 4

Fig. 4: *The two bones of the forearm are the ulna (ul) and the radius (rad). The first is dedicated to movements of flexion and extension, the second to rotation.*

Fig. 5

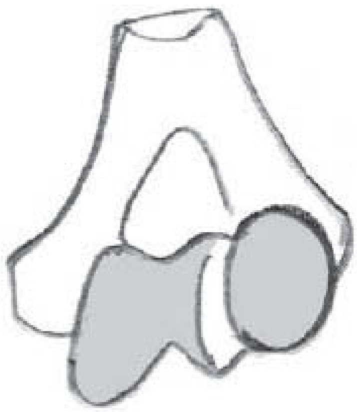
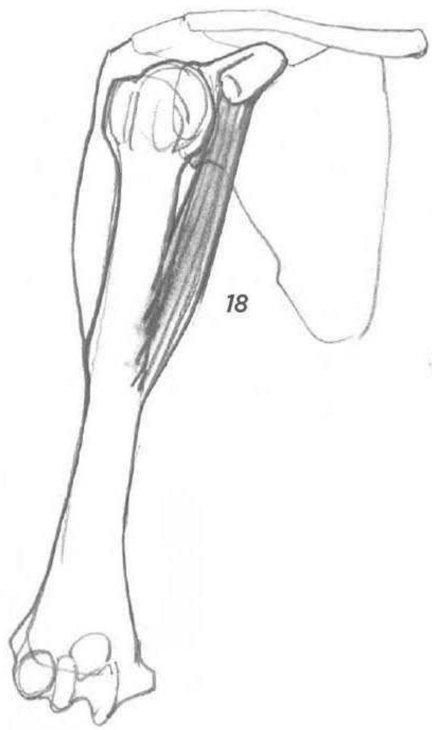
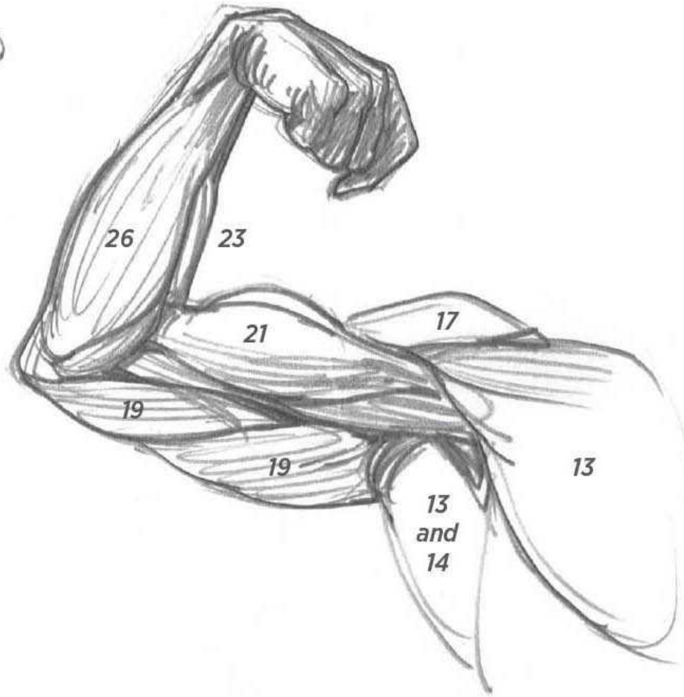
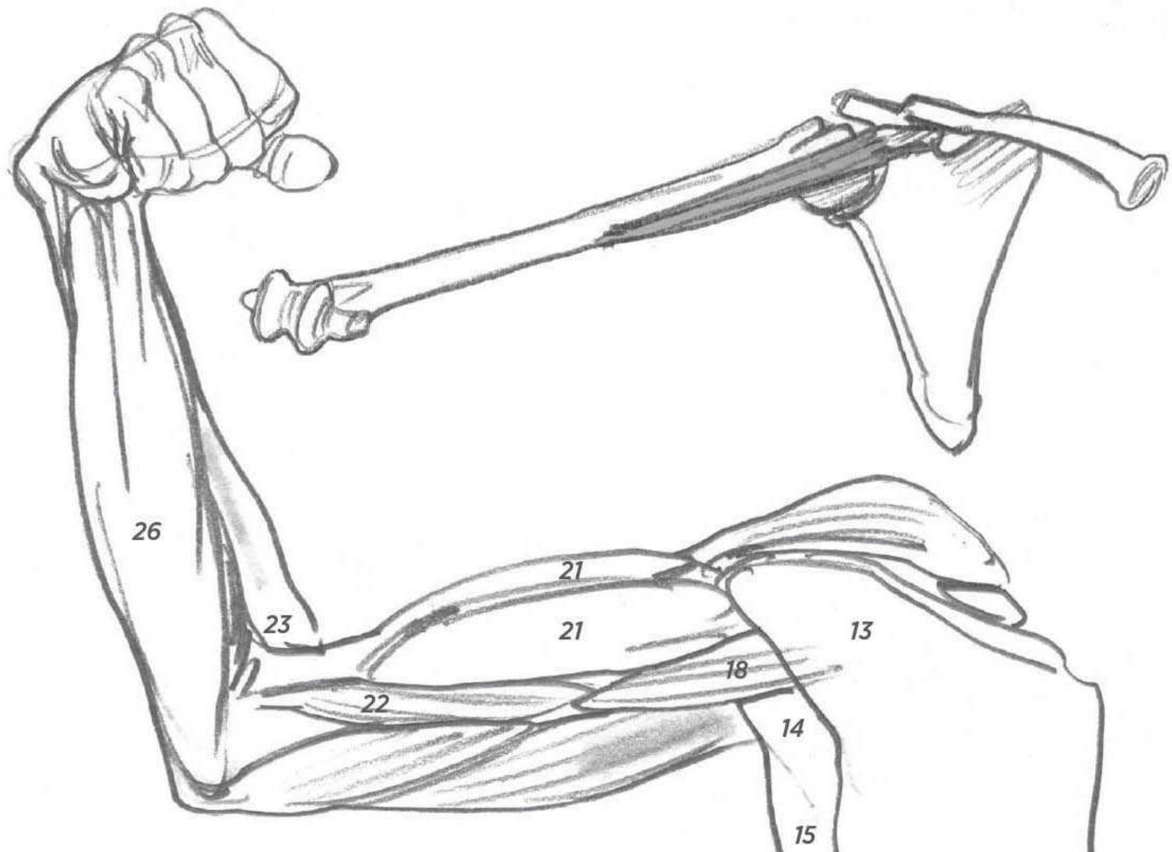
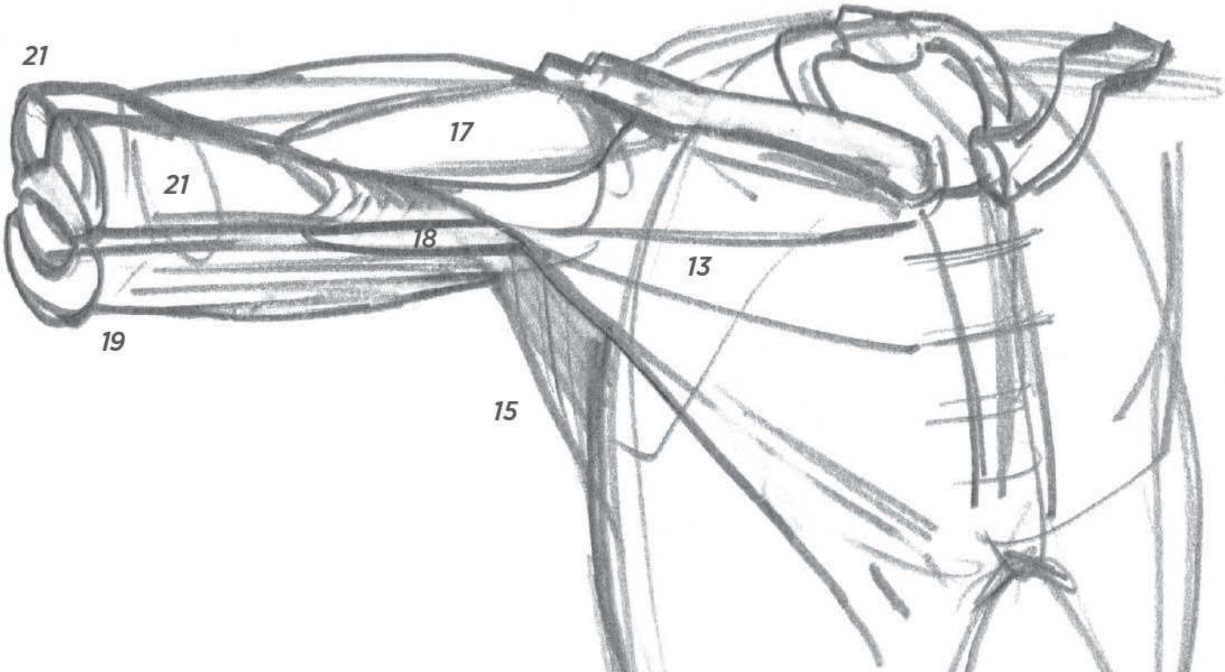


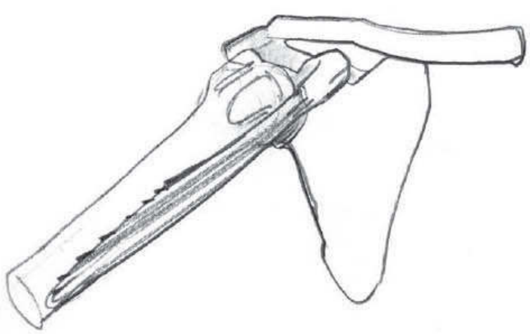
Fig. 5: *There are two types of articulation (joints) that correspond to these two types of movement (and this is true for the entire skeleton): the trochlea (pulley) and the condyle (sphere), which here are attached to the extremity of the humerus (hum). Because the hand is integral to the radius, its rotational movements (pronation and supination) take place at the elbow, on the humerus.*

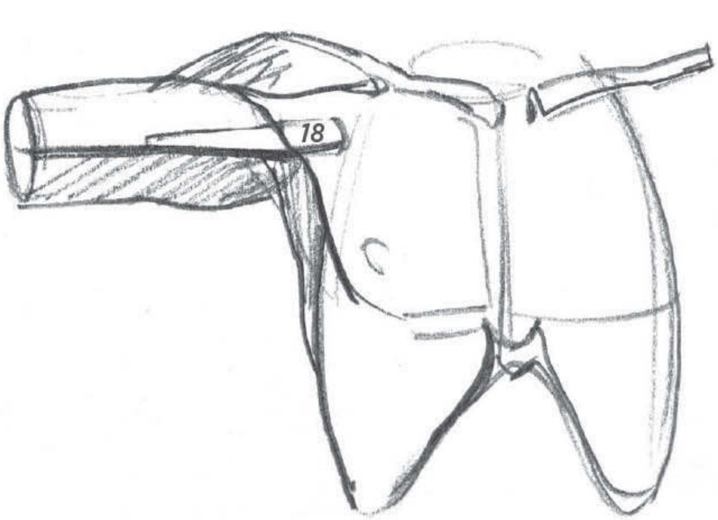

18


26
23
21
17
19
19
13
13
and
14


26
21
23
21
13
18
22
14
15


21
17
21
18
13
19
15




18

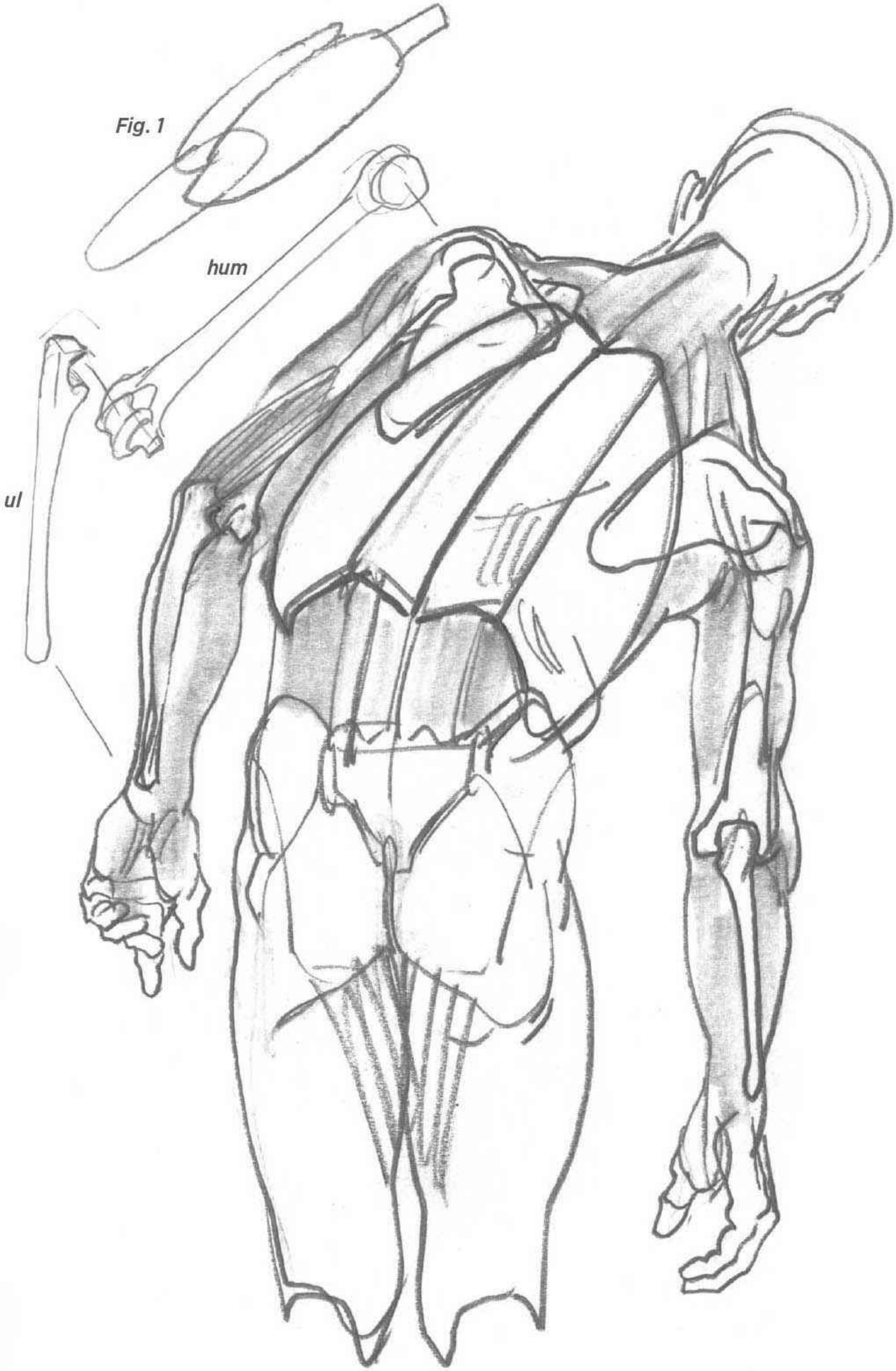
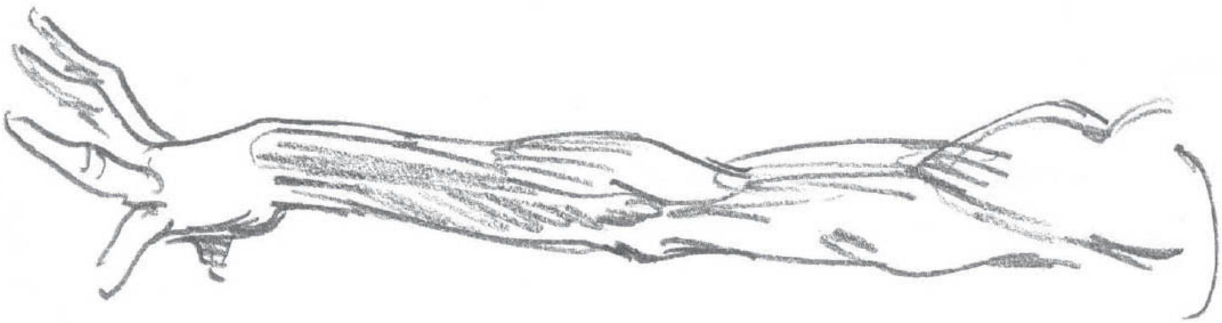


Fig. 1

Fig. 1: *The three bundles of the triceps*.



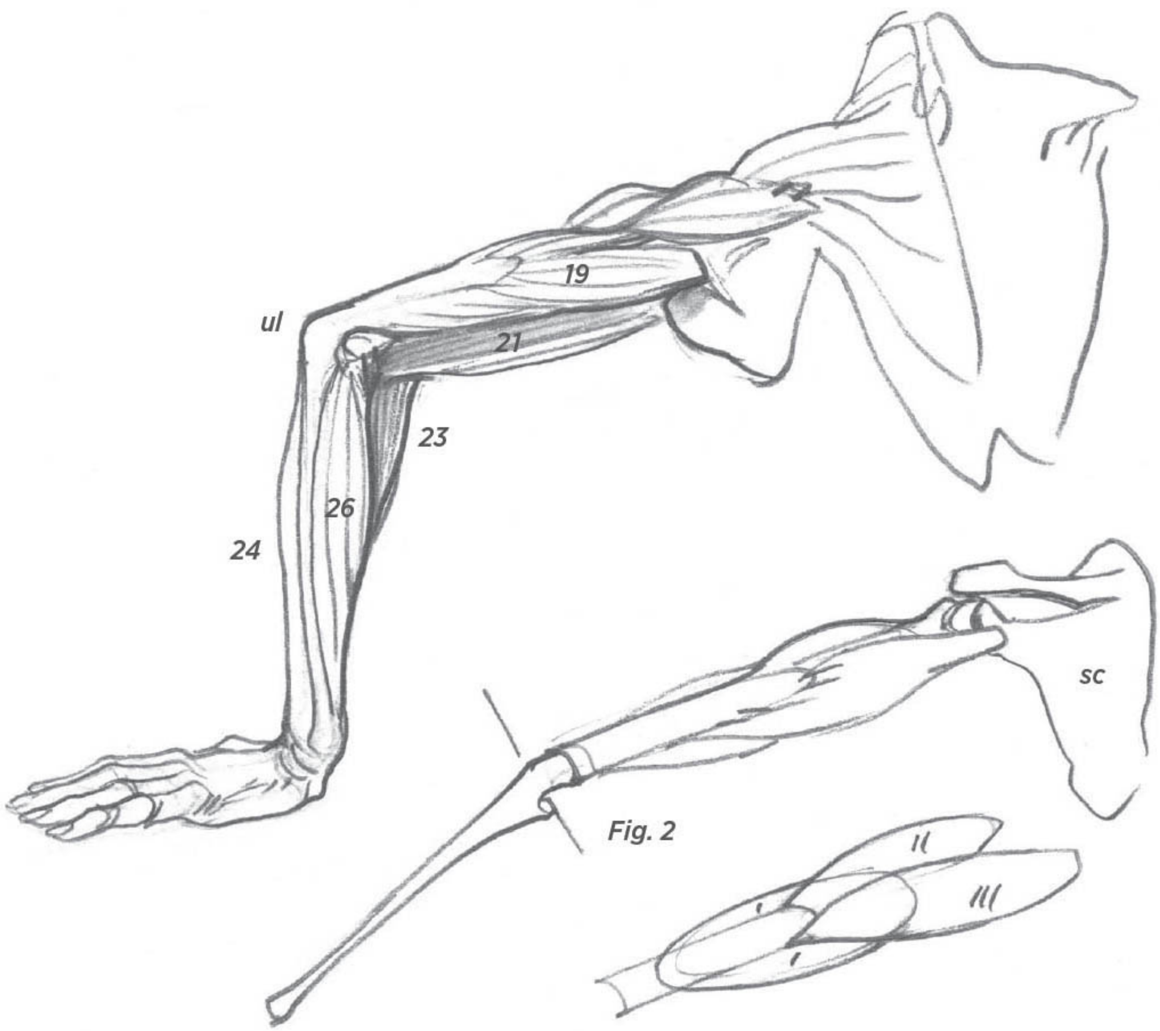
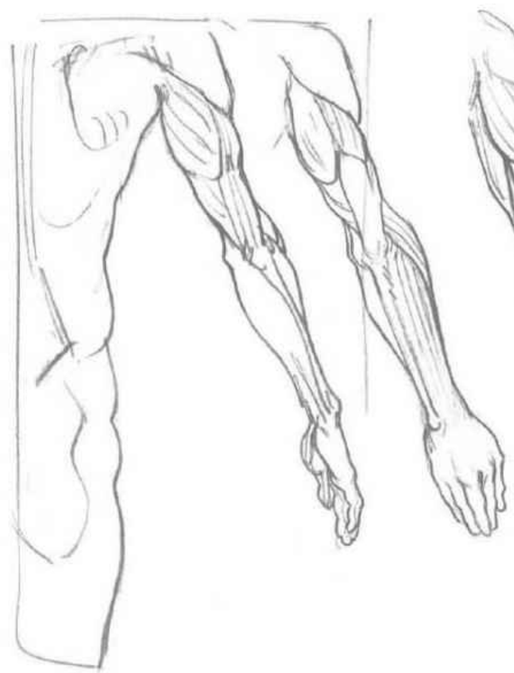
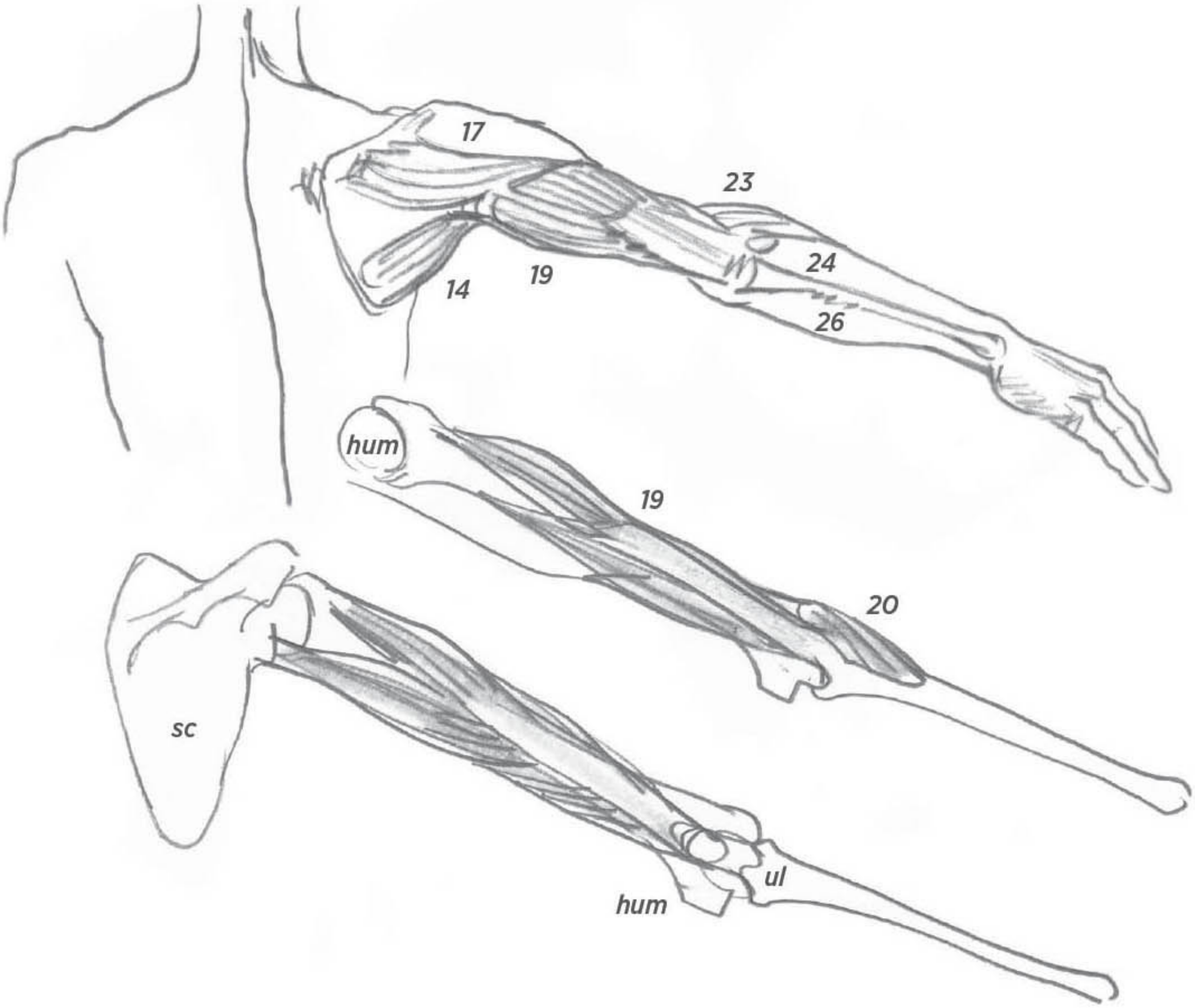
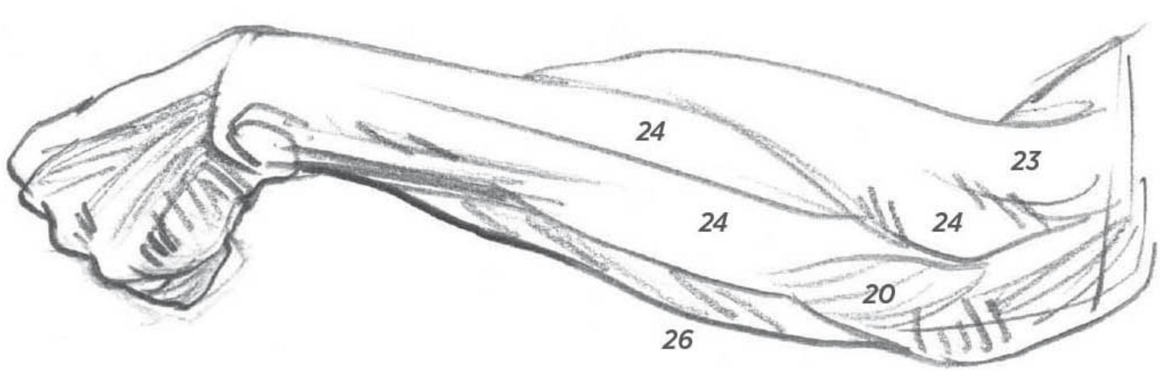


Fig. 2: *Triceps muscle (19) composed of three bundles layered on the humerus. One of the bundles is inserted into the scapula. All three share an insertion (which is the condition for them forming a triceps)*

on the ulna (ul). As with the leg triceps (the calf), the first bundle is covered by a panel of tendons, which receives the two other "twin" bundles.







The anconeus (20) is a small, secondary muscle that appears to

continue the action and the outline of the triceps (19), extending further down on the ulna (ul).

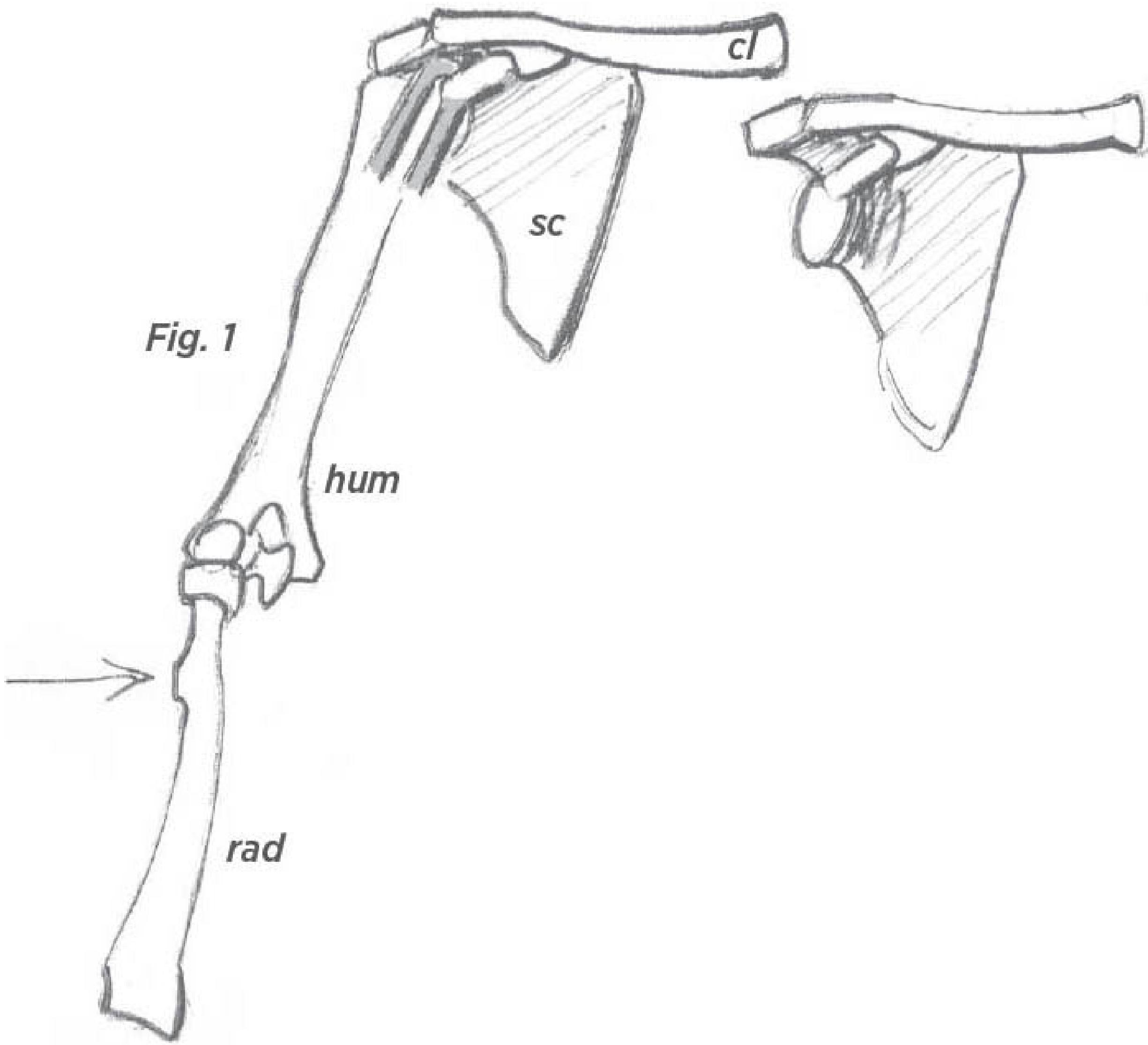


Fig. 1: *In this drawing, the two upper tendons of the biceps (21) are visible at the level of their insertion into the scapula (sc). From there, the biceps continue on to attach to the radius (rad), at the point shown by the arrow.*

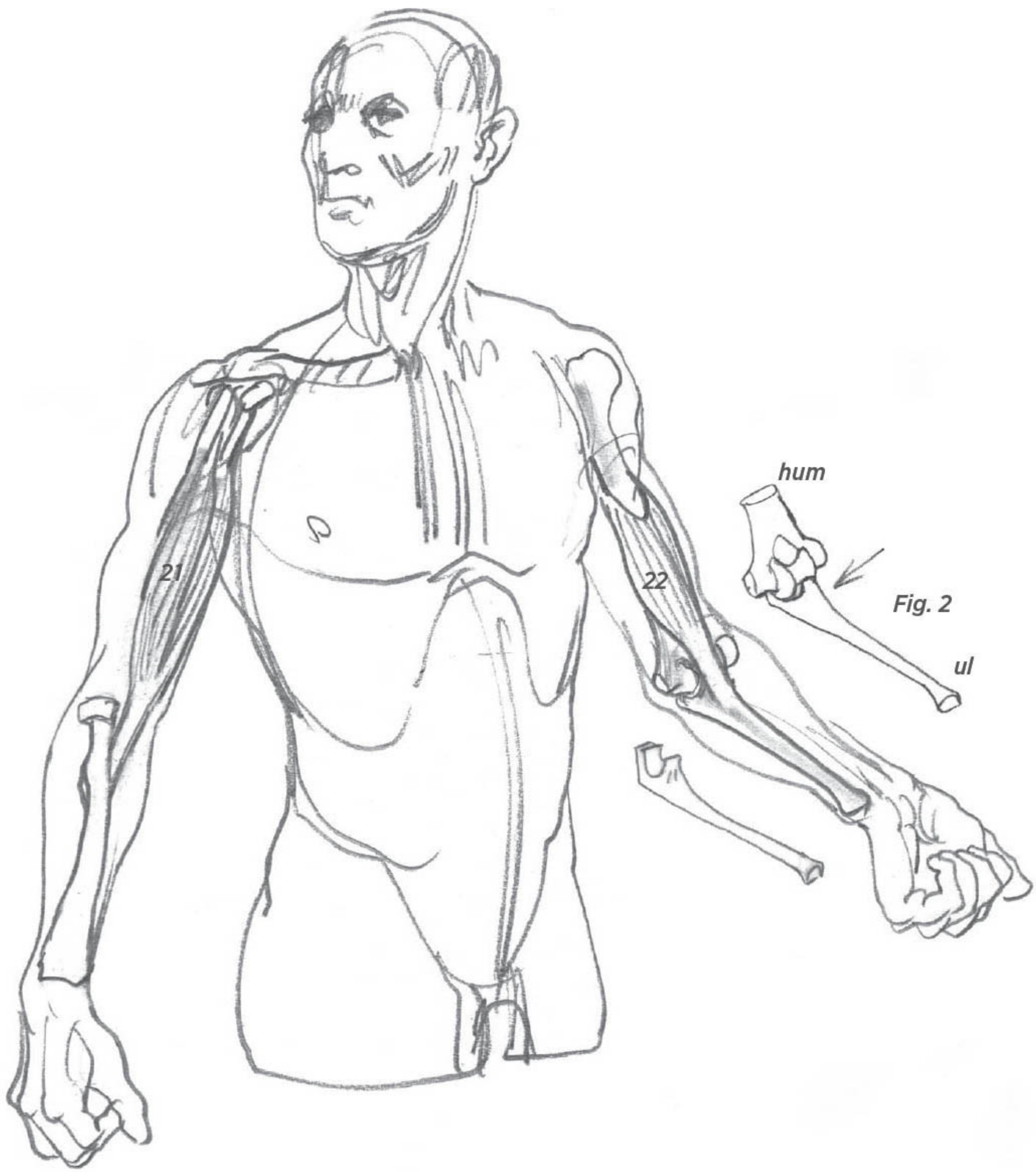


Fig. 2: *The brachialis (22), starting at the humerus (hum), fits into the ulna (ul) at the point shown by the arrow.*

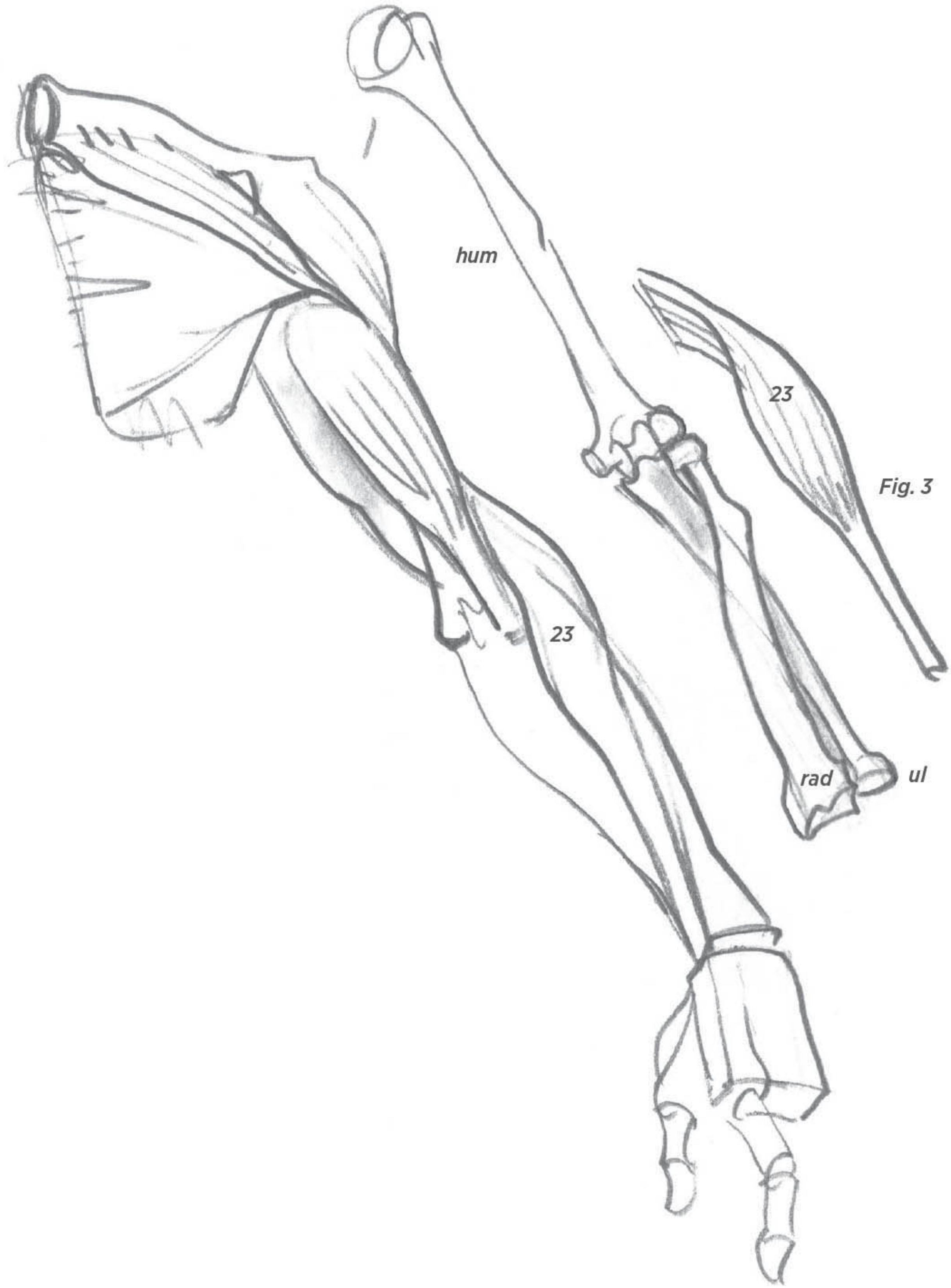


Fig. 3: *In this position, the two bones of the forearm cross each other.*

The brachioradialis (23) follows the trajectory of the radius (rad) and has a diagonal layout on this segment.

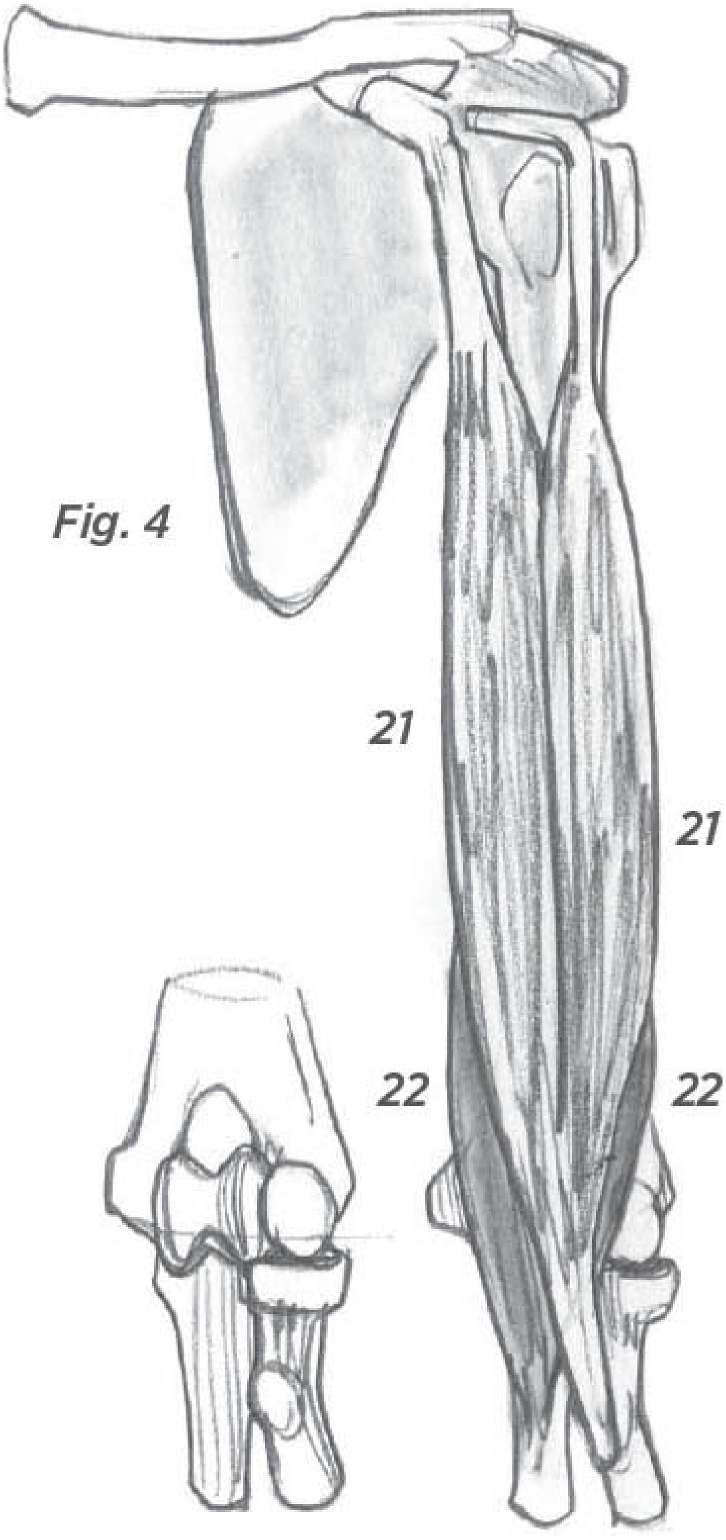


Fig. 4

Fig. 4: *The brachialis (22) is covered by the biceps (21), but it remains visible on the sides.*

Fig. 1

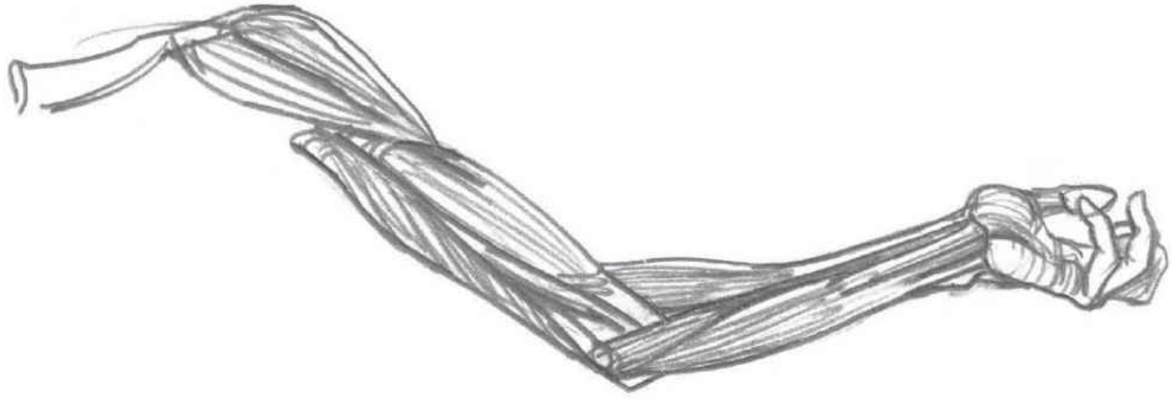
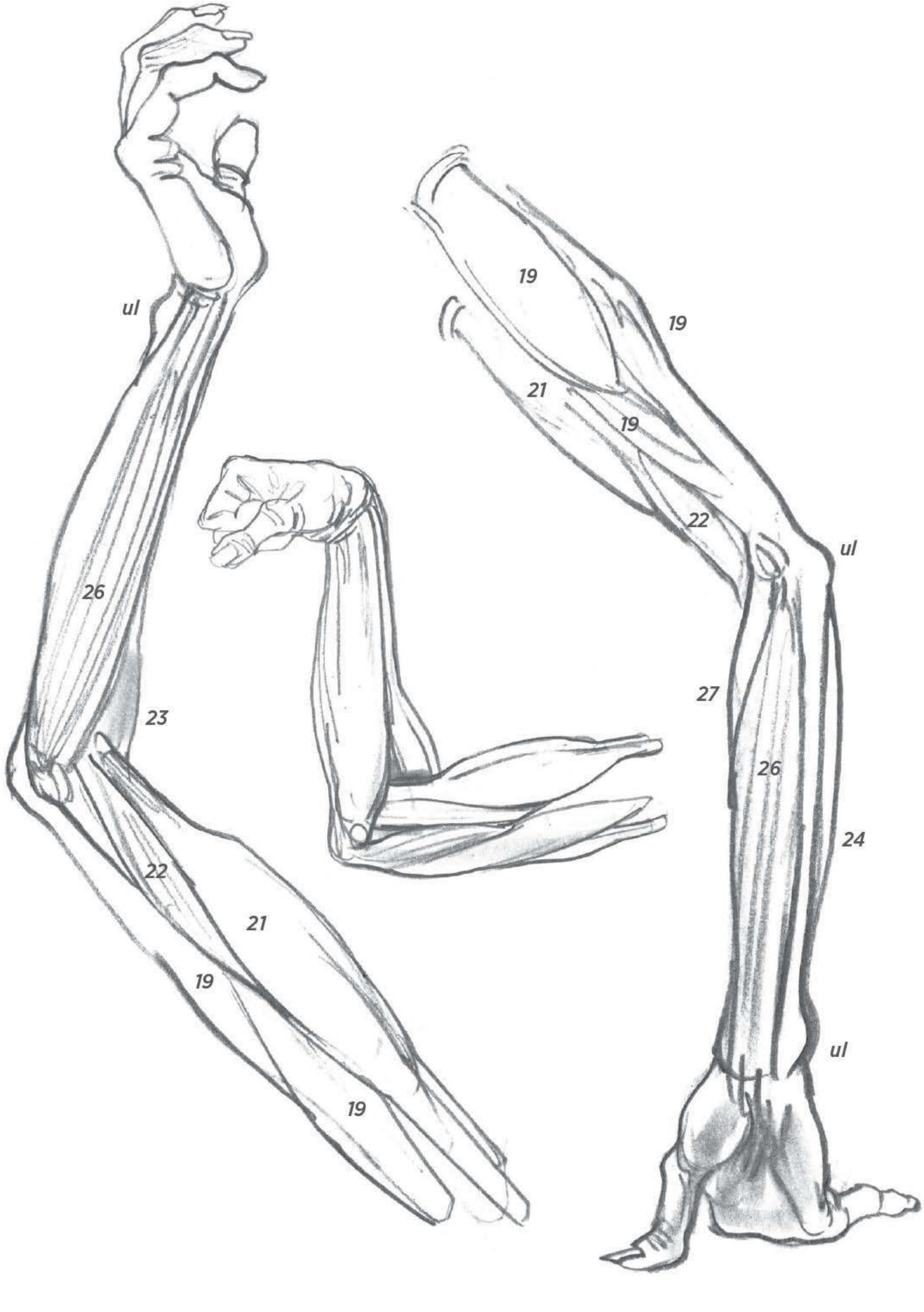
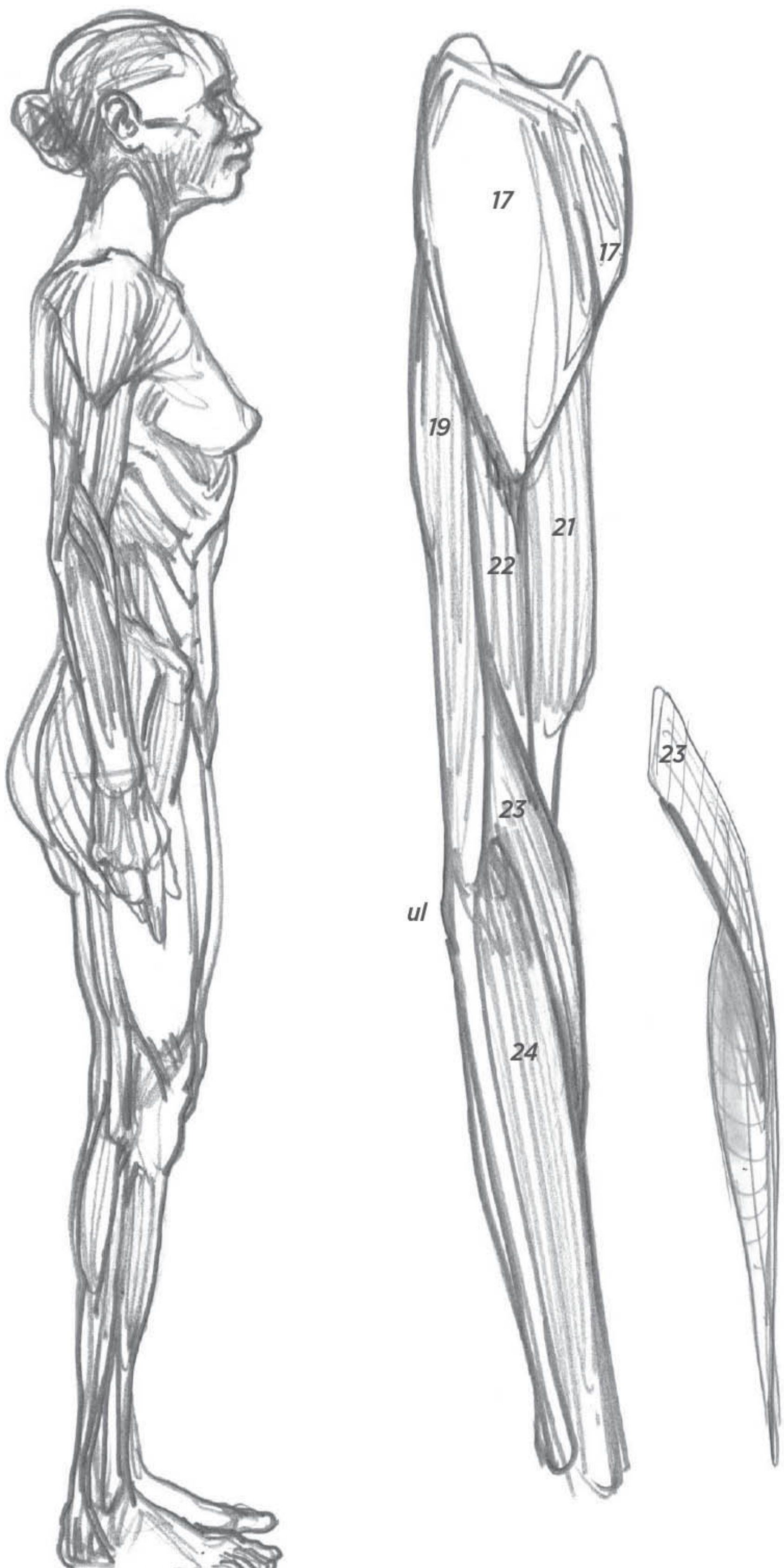


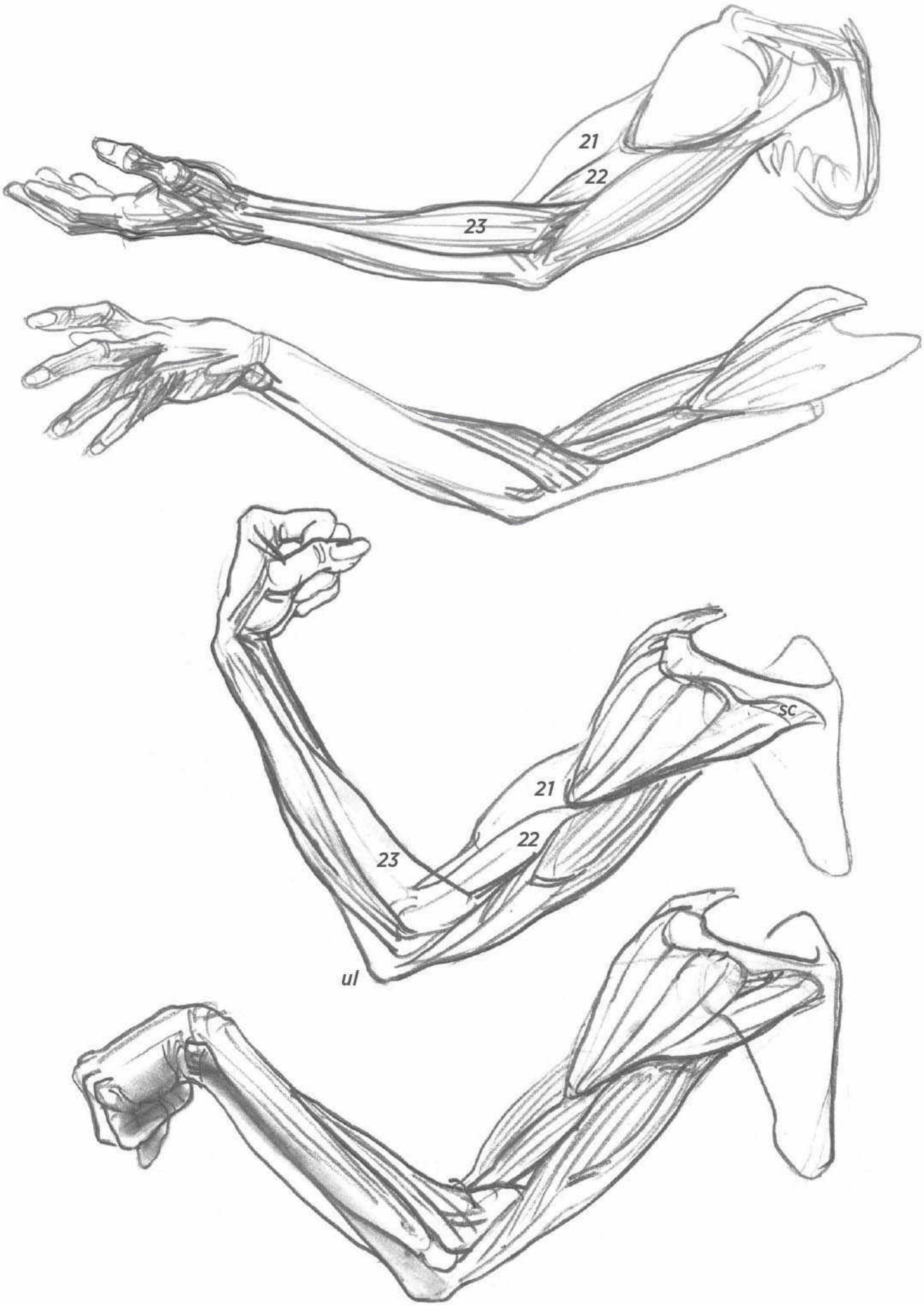
Fig. 1: *The brachialis (22) outflanks the biceps (21) on the inside and the outside of the arm.*


19
ul
19
21
19
22
ul
26
27
23
26
22
24
21
19
ul
19



17
17
19
21
22
23
ul
24
23

The brachioradialis (23) is inserted above the elbow joint. At this level, it remains flattened against the biceps (21) and the brachialis (22). It thickens and takes on a tapered shape as it descends below the joint.


21
22
23
sc
21
22
23
ul


21
23
26
24

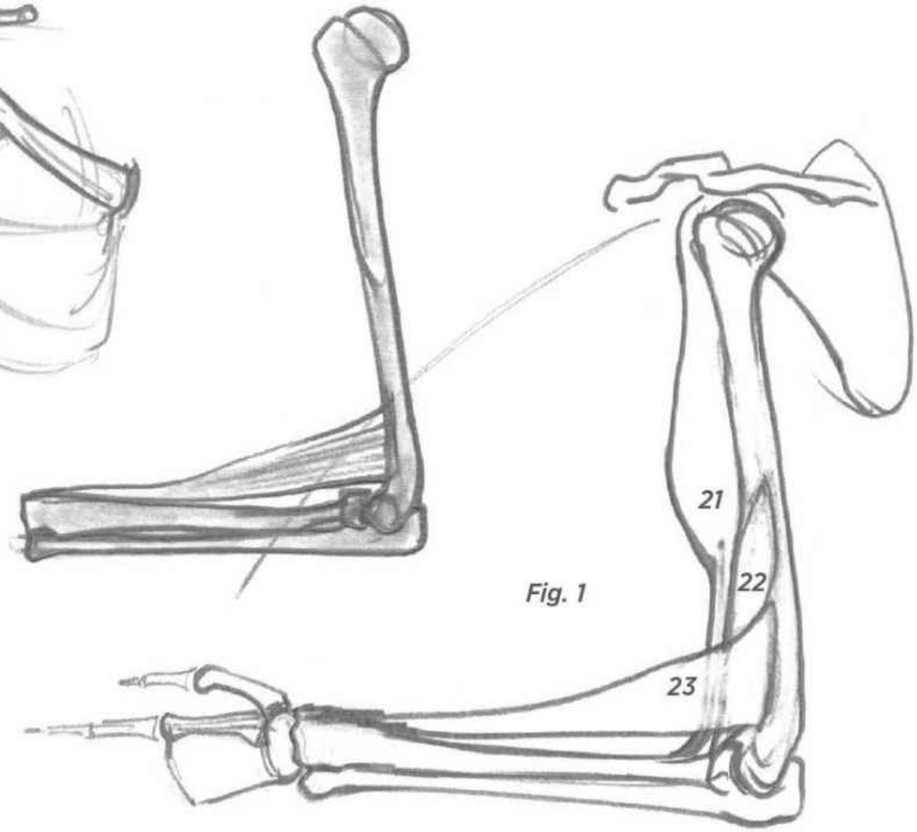


Fig. 1

Fig. 1: *The group of flexors of the forearm*.


21
23
26

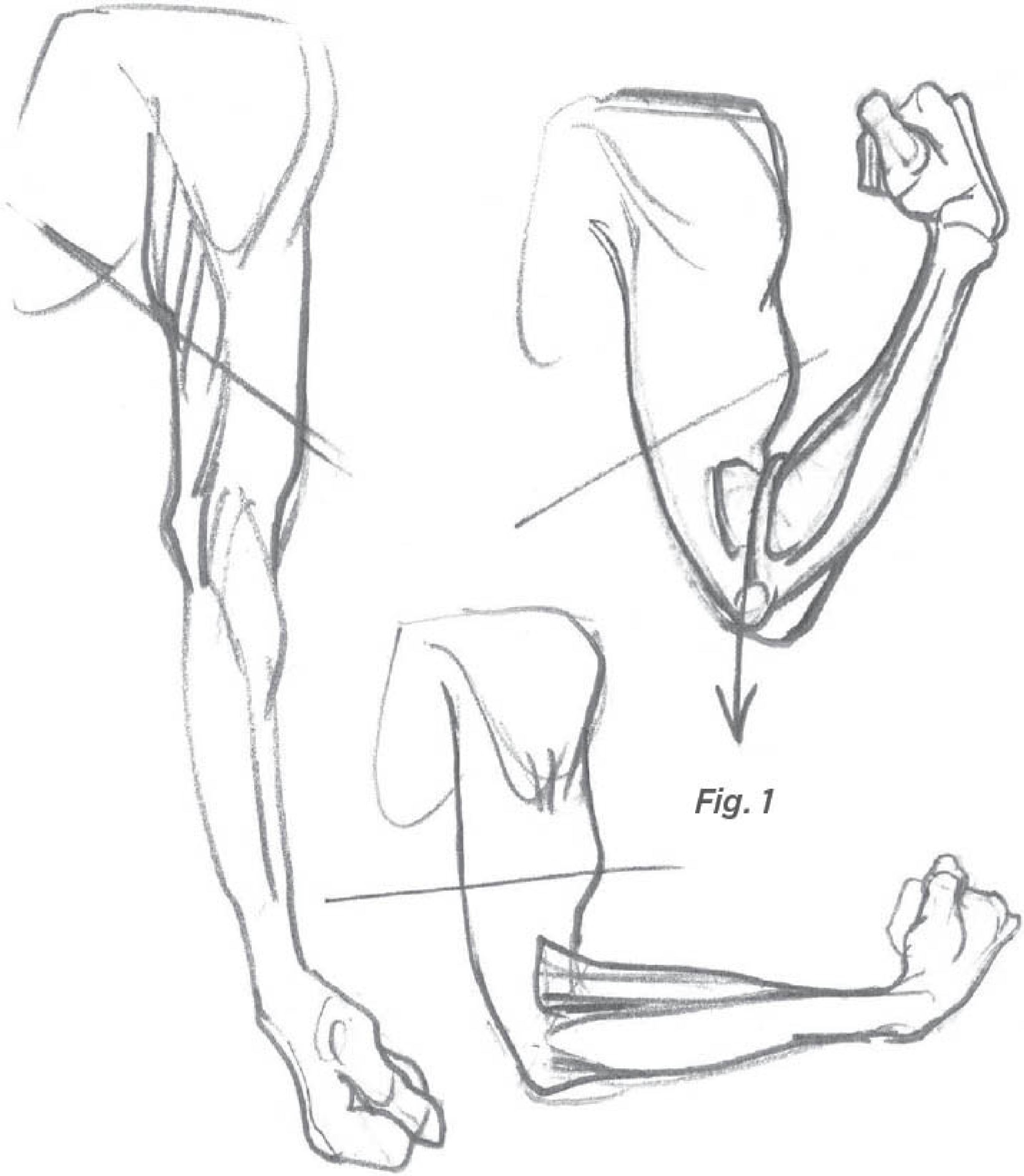


Fig. 1: *The brachioradialis flanged at the level of the flexed fold. Inverted curves of the contours of the arm in extension and flexion.*

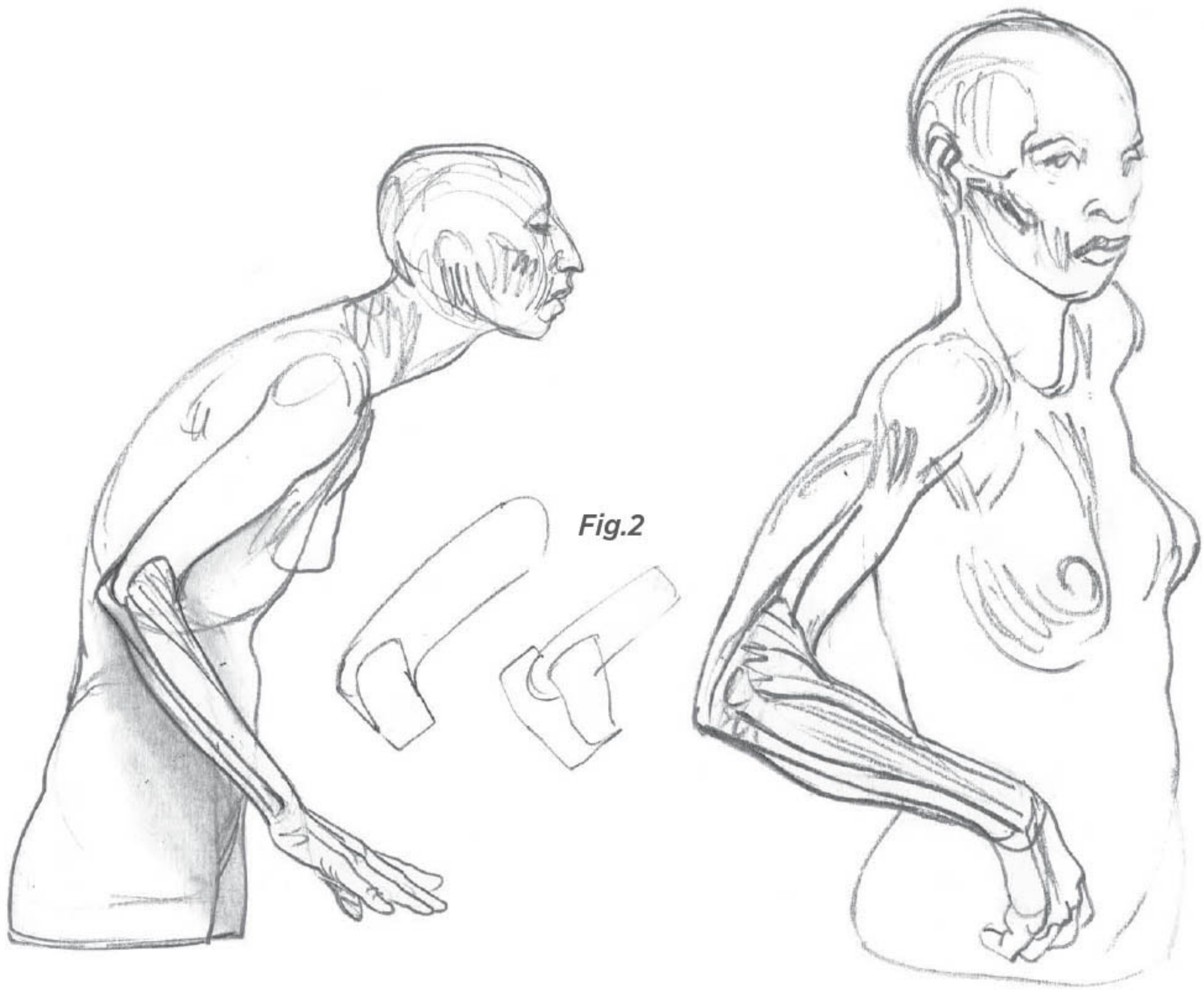


Fig. 2: *Interlocking of the arm and forearm segments*.

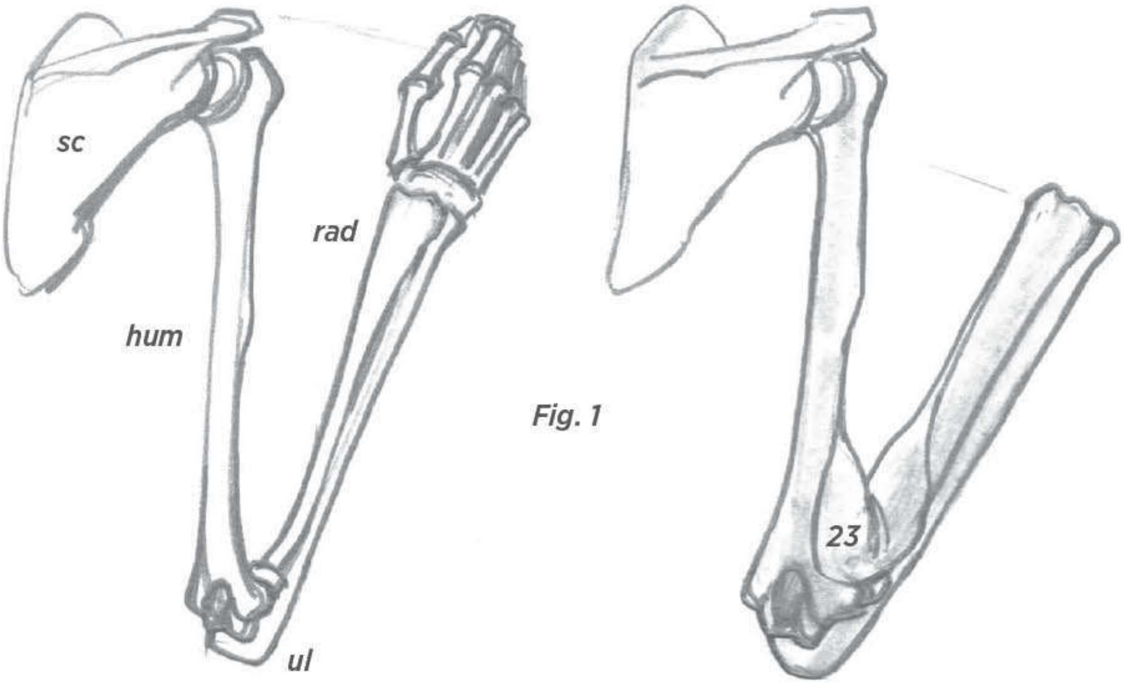
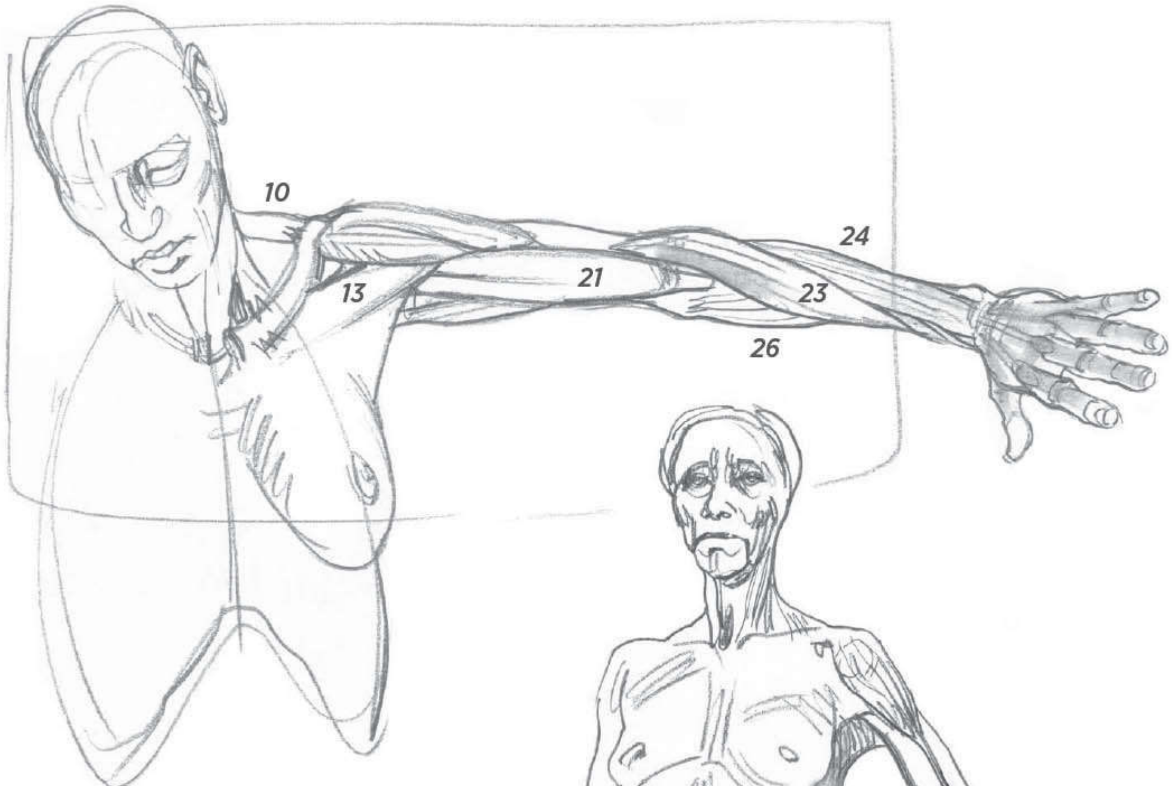
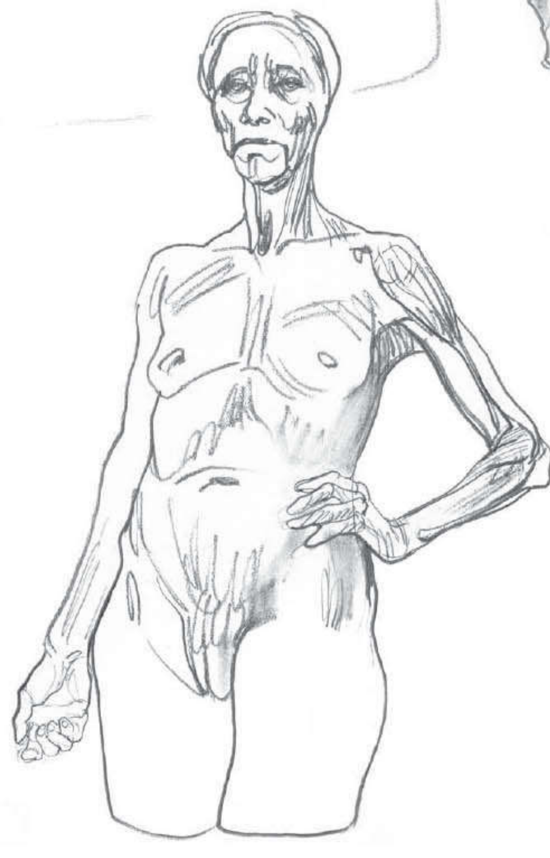
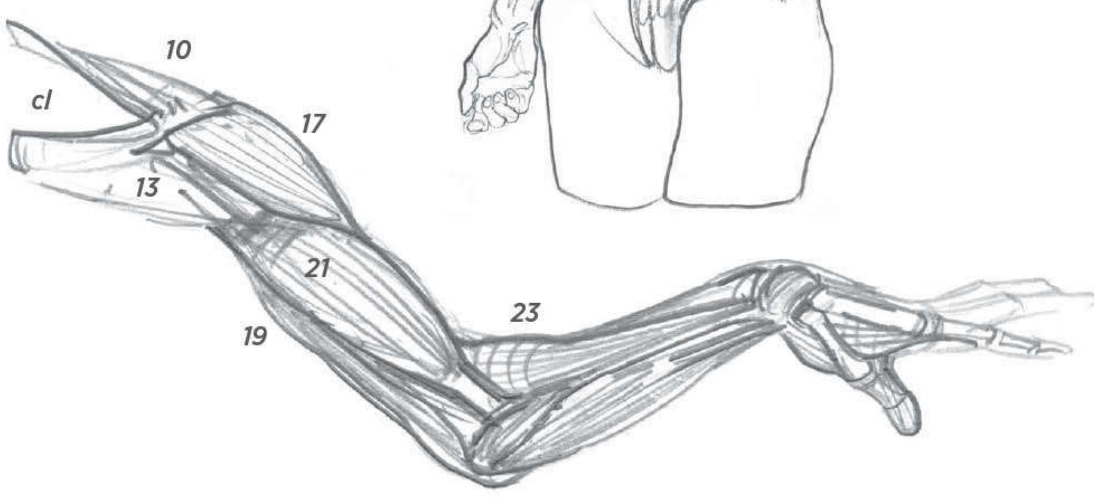


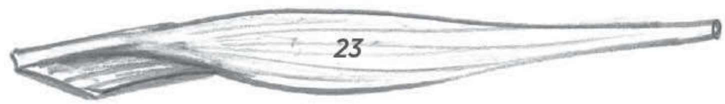
Fig. 1

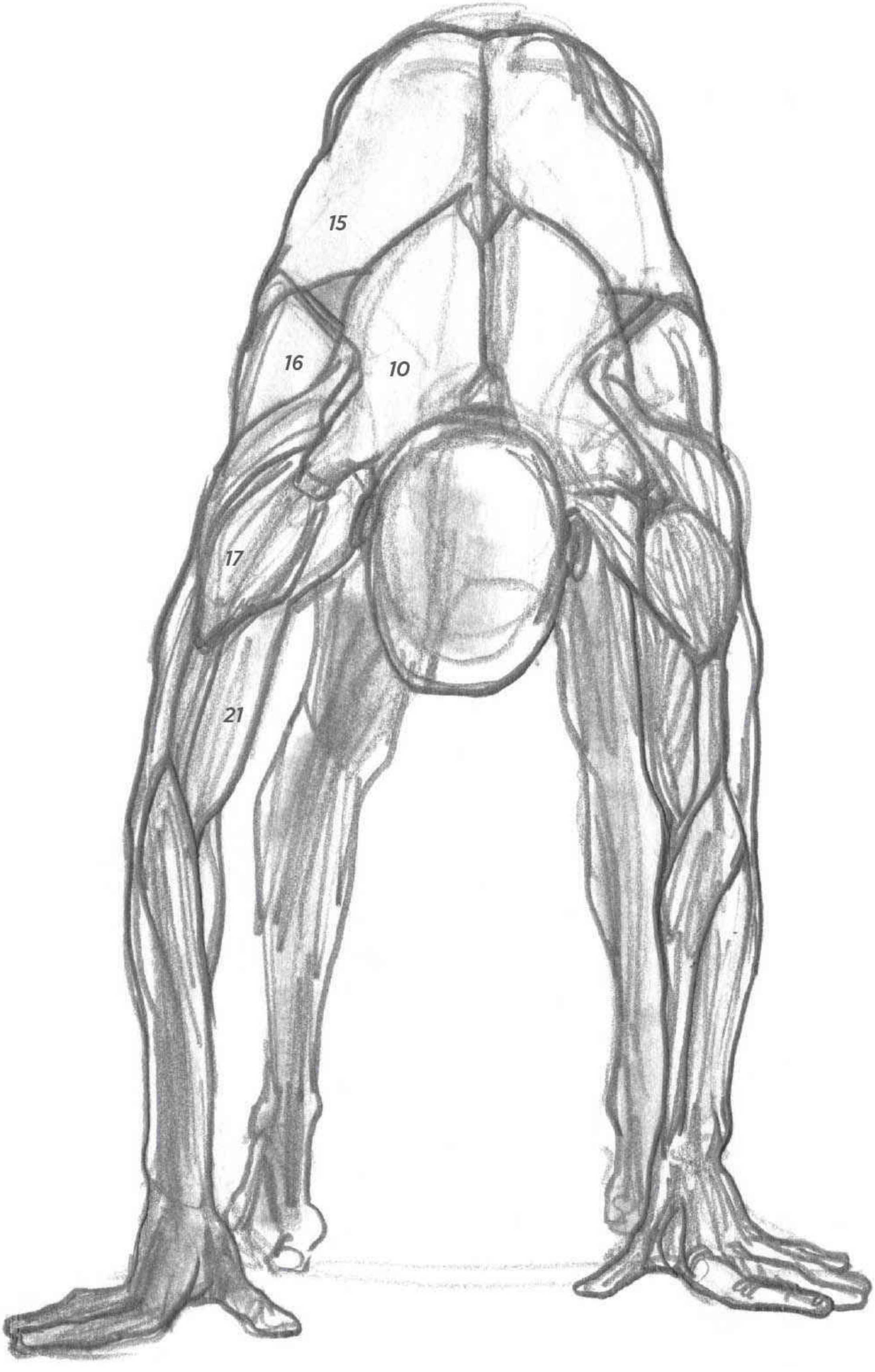
Fig. 1: *When the forearm is pulled up against the upper arm, the brachioradialis is flanged at the level of the flexion fold. It can then be sketched in two volumes. This same kind of configuration can also be found in the hip area, with the tensor muscle of the fascia lata (36).*

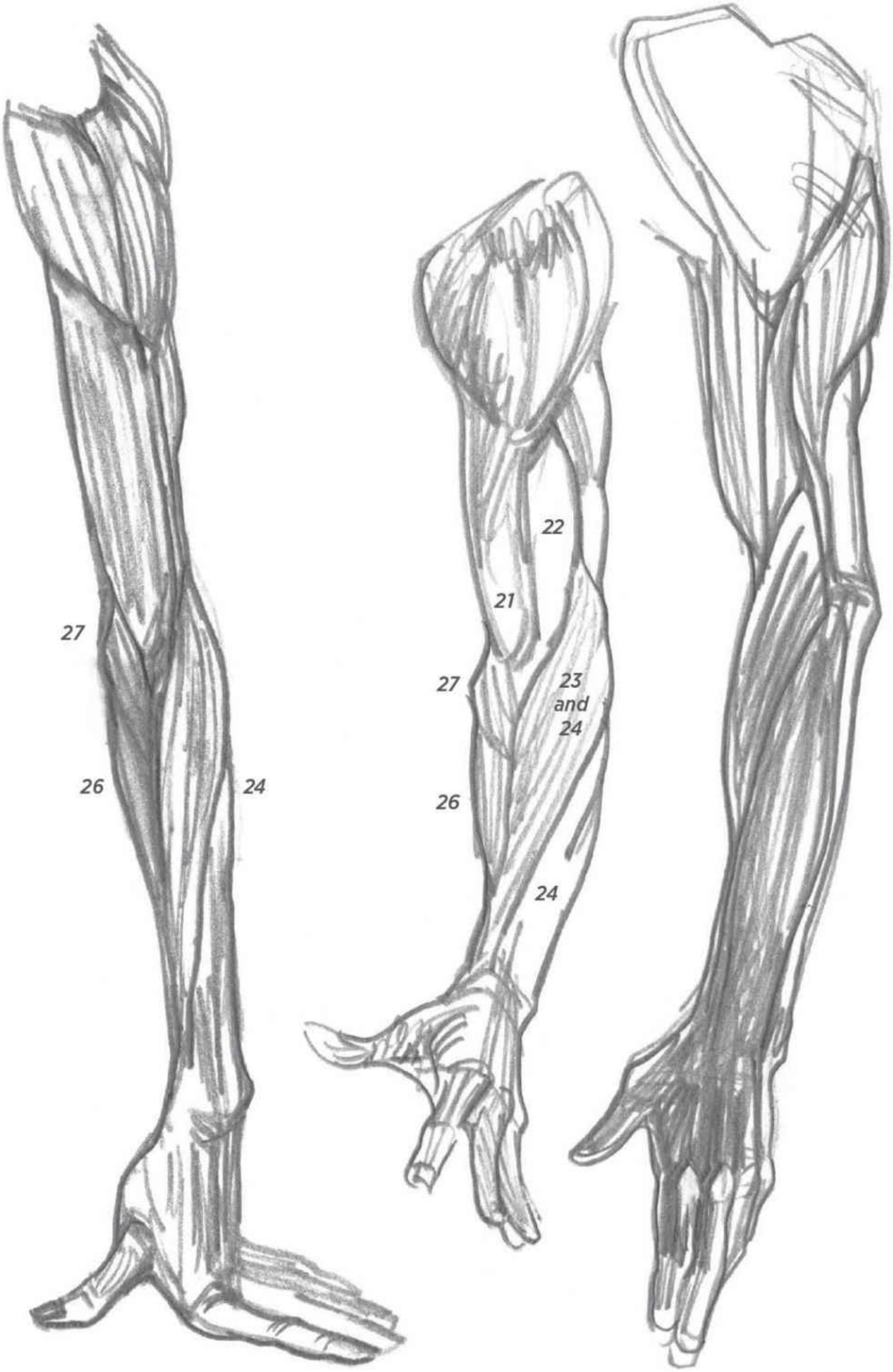

10
24
21
13
23
26

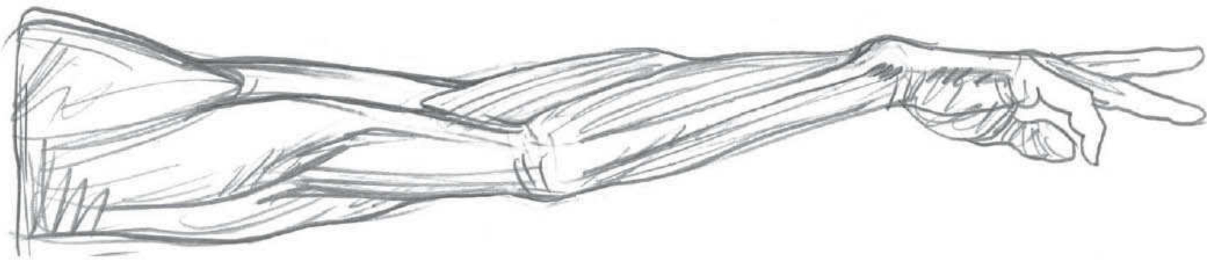
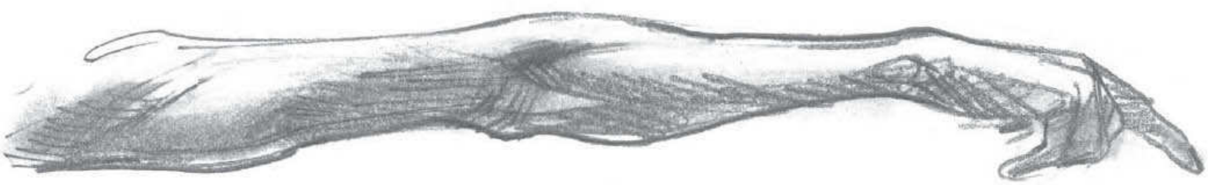


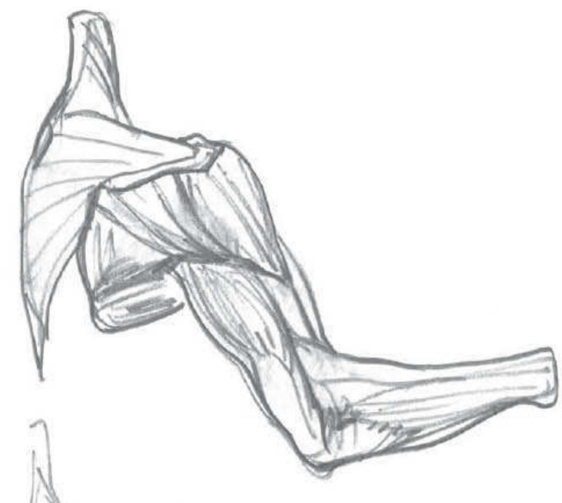

10
cl
17
13
21
23
19


23


15
16
10
17
21


27
26
24
22
21
27
23
and
24
26
24





23
24
23
24
25
24
25
23
24

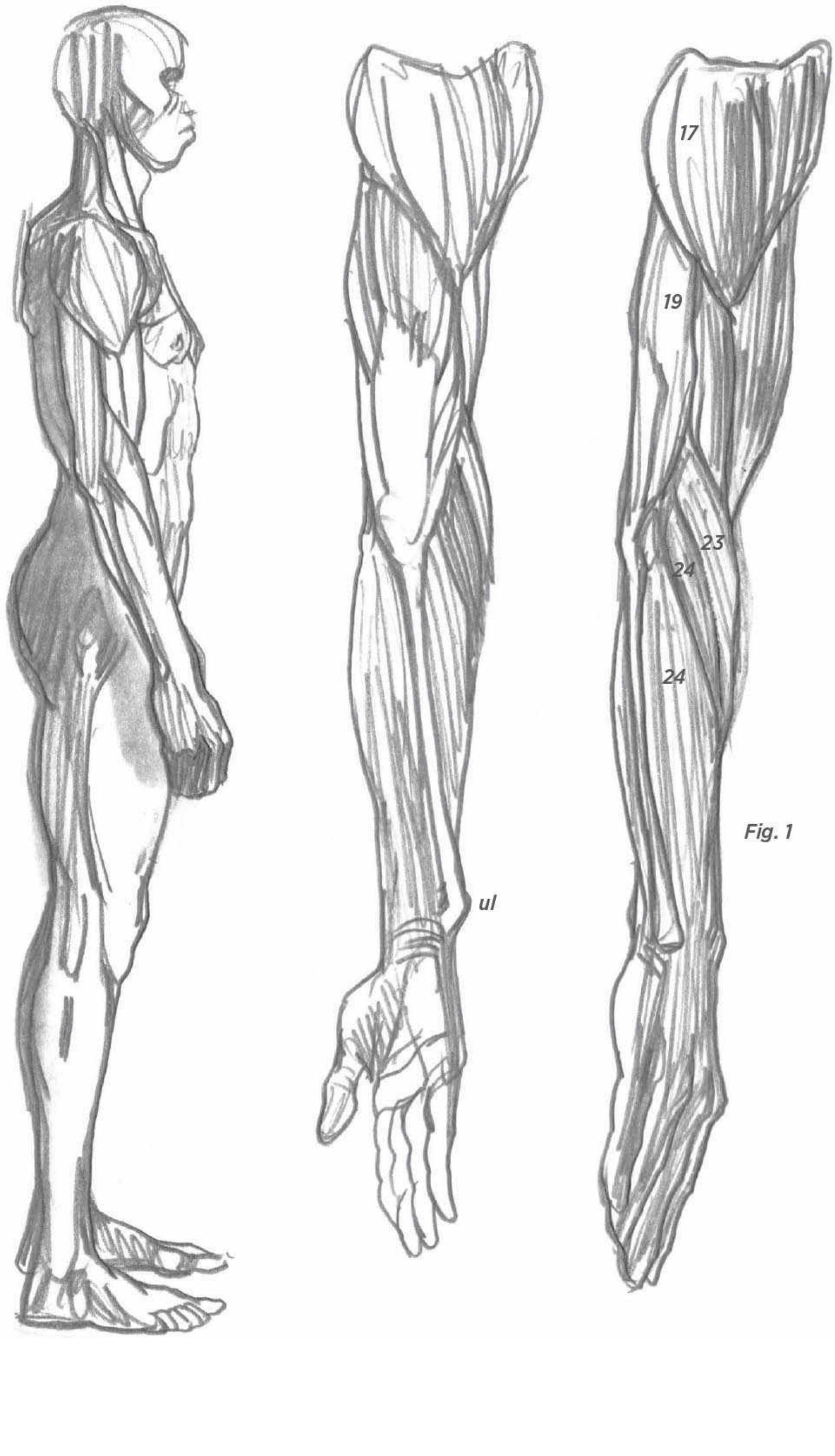


Fig. 1

Fig. 1: *Refined version of the brachioradialis (23), distinct from the first radial (lateral bundle of the extensor group, 24).*

Fig. 2

Fig. 2: *Simplified version. The two muscles are joined into one form, which is, however, dominated by the brachioradialis (23).*


23
24
26

Fig. 1

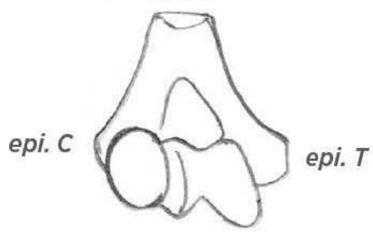


Fig. 1: *The main muscles that operate the hand and fingers are inserted into the extremity of the humerus. The extensors (24) are attached to the epicondyle (epi. C), and the flexors (26), which are stronger, are attached to the epitrochlea (epi. T). This difference in strength explains the difference in proportions between the two bone markers.*

Fig. 1

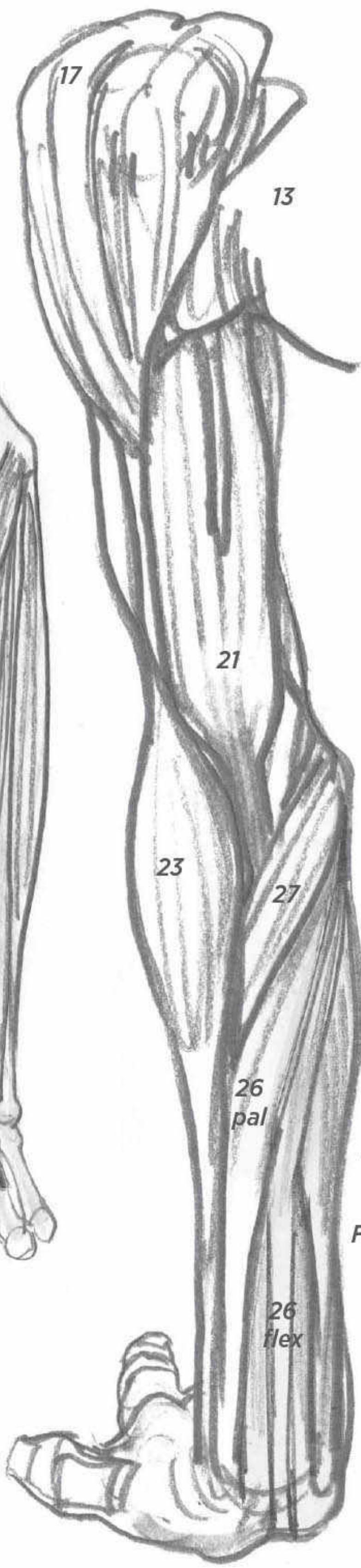
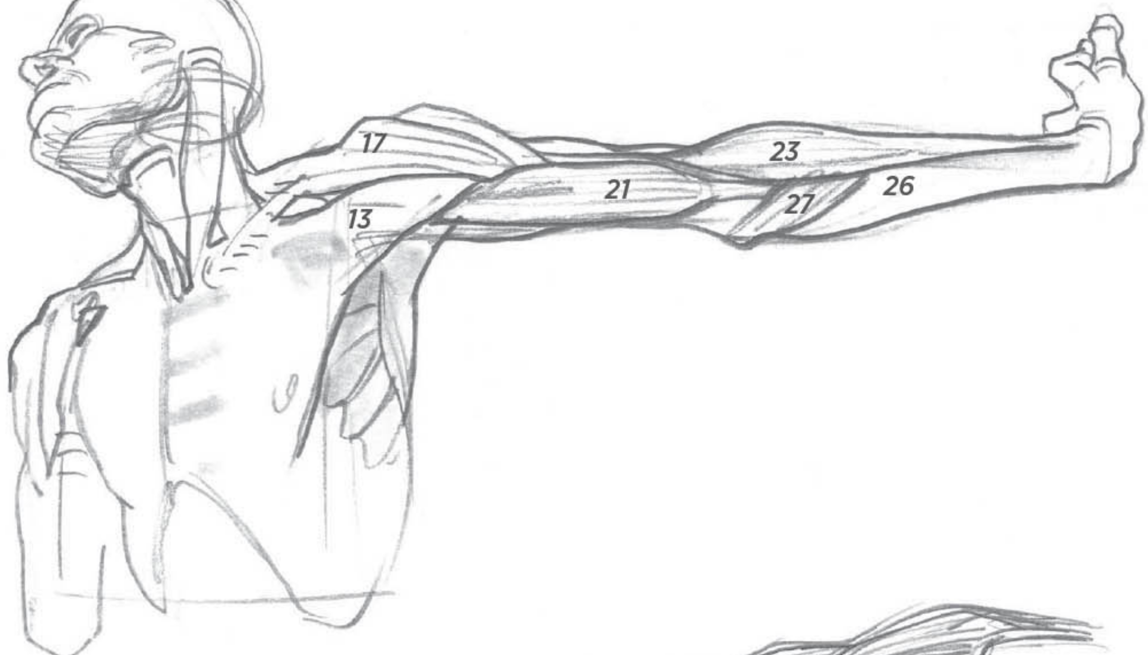
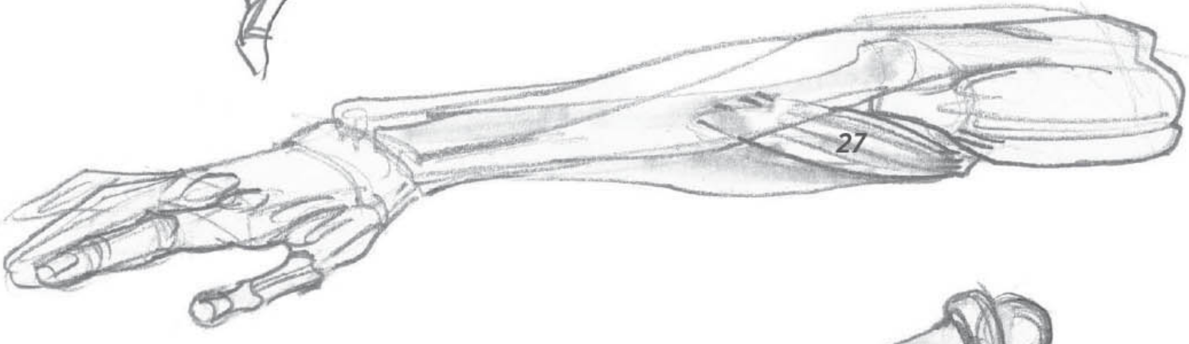
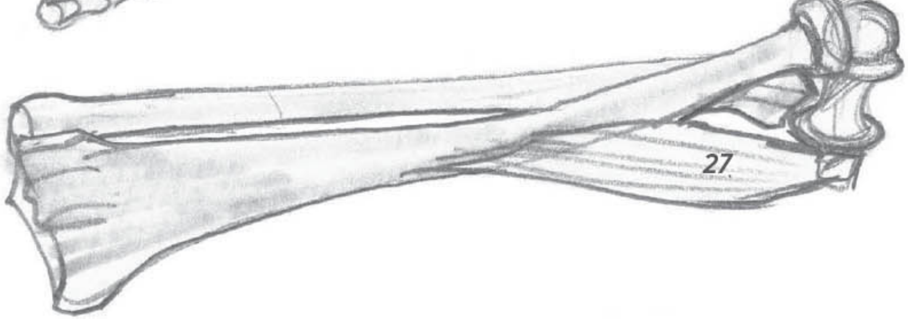


Fig. 2

Fig. 1: *The central bundle, called the "small palmaris," belongs to the flexor group. It is inserted into the fascia of the palm (cut into a triangle here).*

Fig. 2: *The flexor group (26) includes the palmaris longus (pal) or flexor carpi radialis, the flexor carpi ulnaris (carp ul), and the shared flexor of the fingers (flex), partially covered by the small palmaris.*


17
23
21
26
27
13


27

27

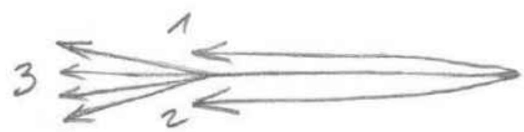


Fig. 1

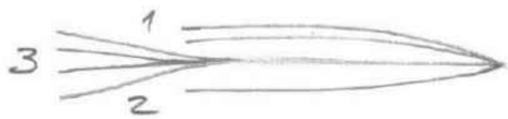


Fig. 2

Fig. 3

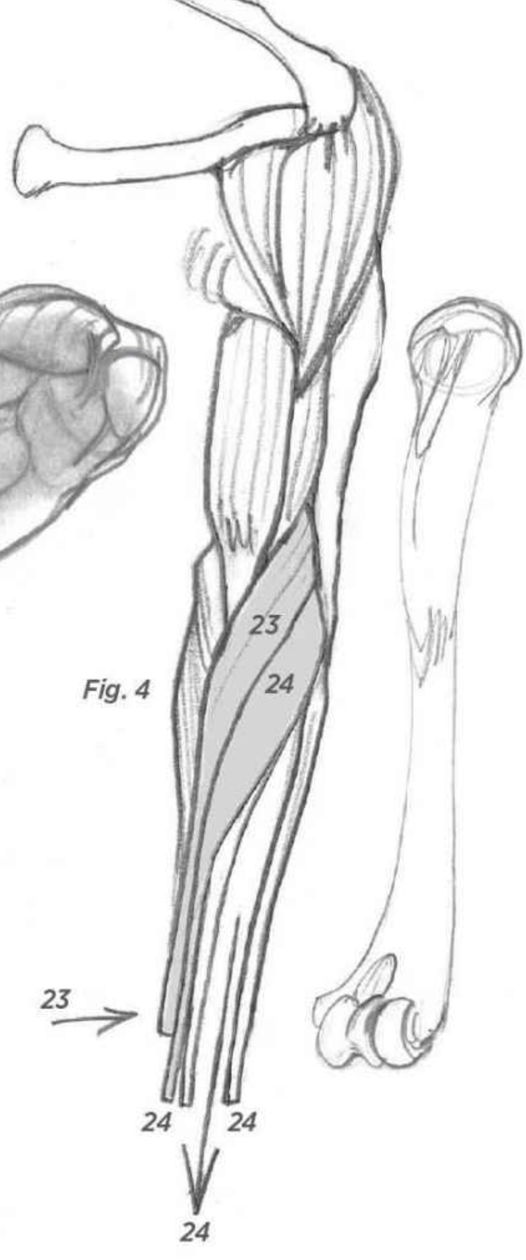
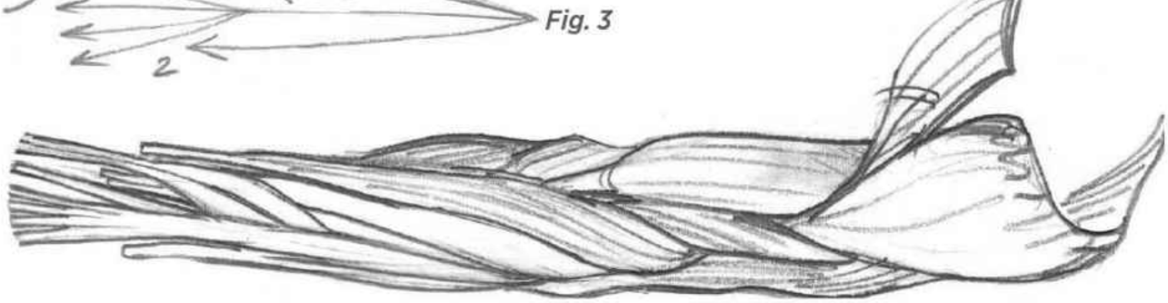


Fig. 4



Other than the drawings on this spread, we have favored simplified

versions of the forearm, which correspond, in my opinion, to the majority of observable cases. Here, however, you will find a few more detailed drawings.

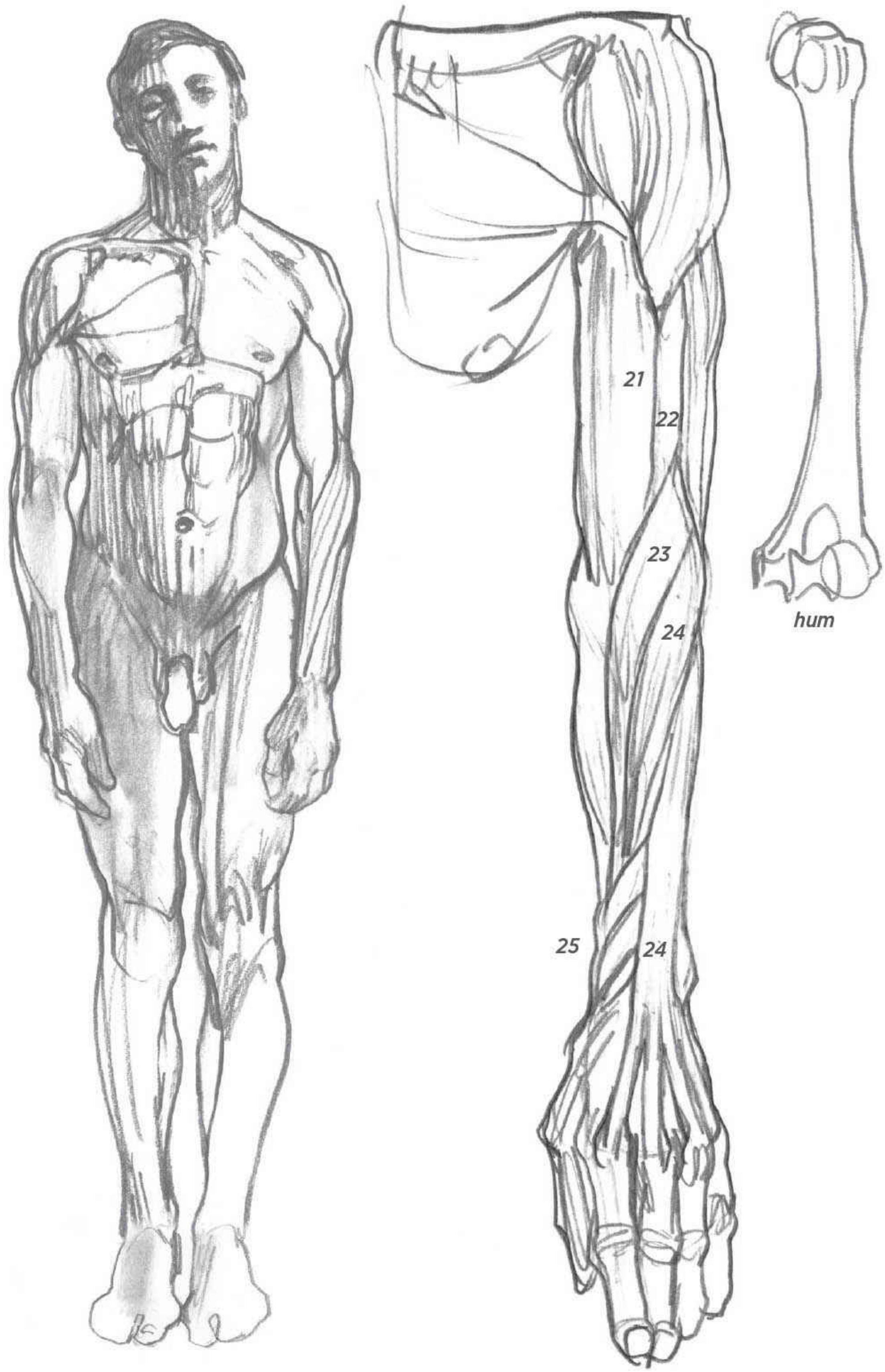
In increasing order of detail:

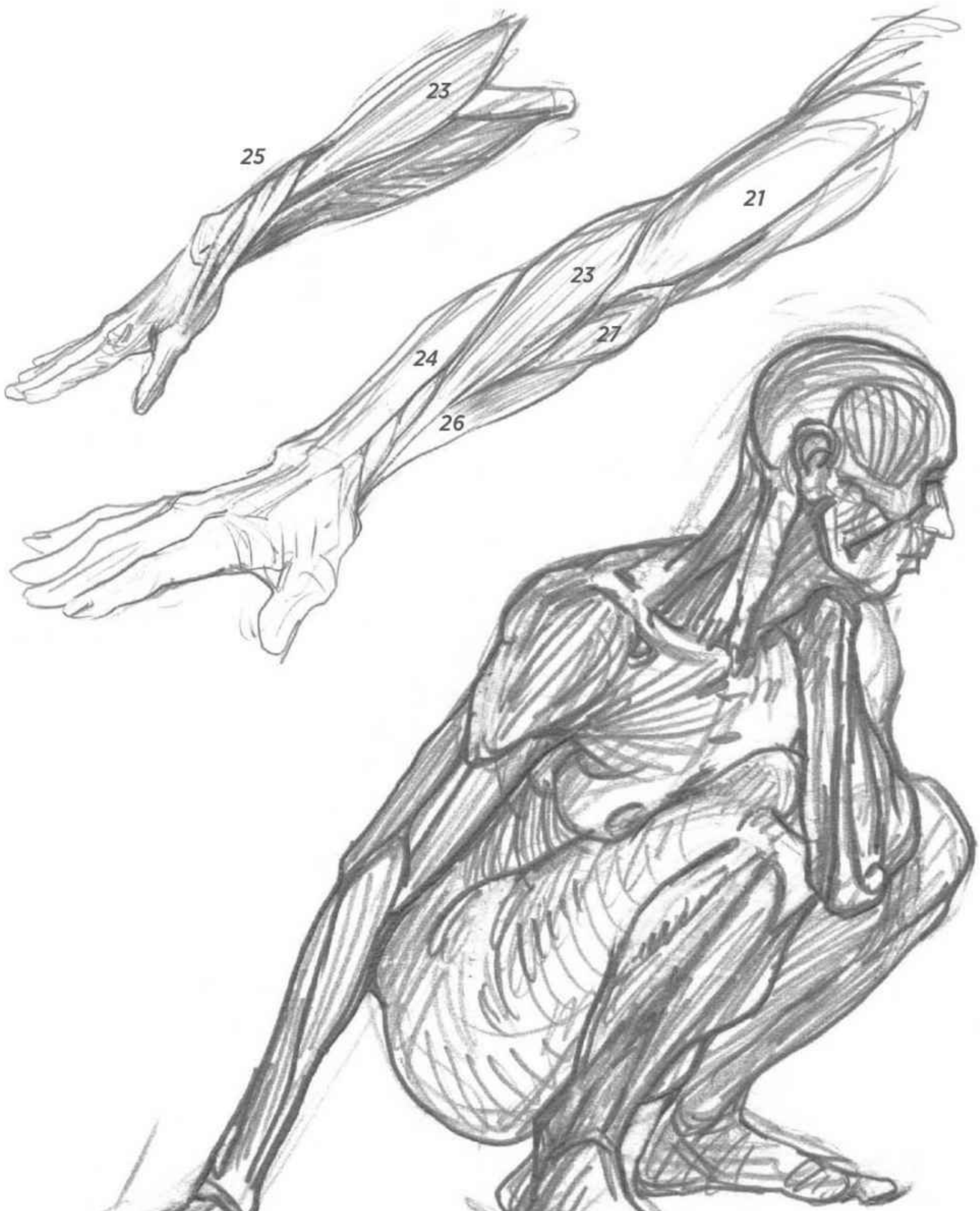
Fig. 1: *The group of extensors (24), made up of several bundles. At the center, the extensor digitorum communis is surrounded by the extensors of the hand*.

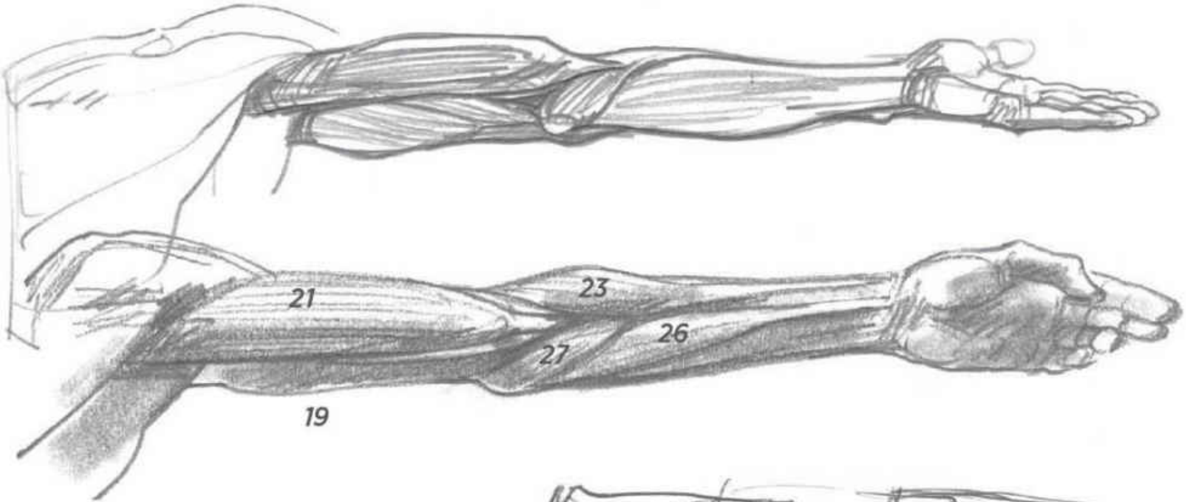
Fig. 2: *On the side of the radius (or of the thumb), the hand extensor can be split into first and second radials*.

Fig. 3: *The thumb has its own system of extensors (three small bundles)*.

Fig. 4: *The brachioradialis (23) and the first radial of the extensor group (24) are often merged*.


21
22
23
24
25
24
hum


23
25
21
23
27
24
26



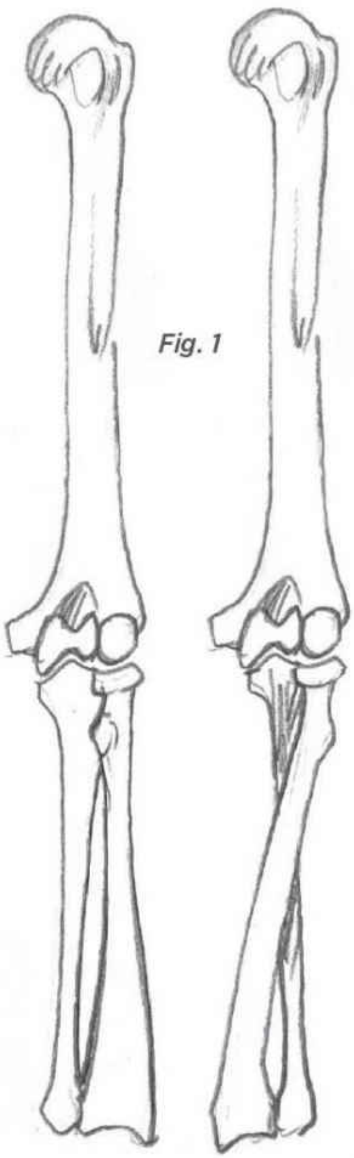


Fig. 1

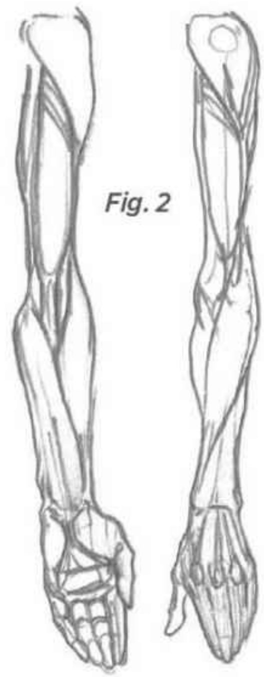
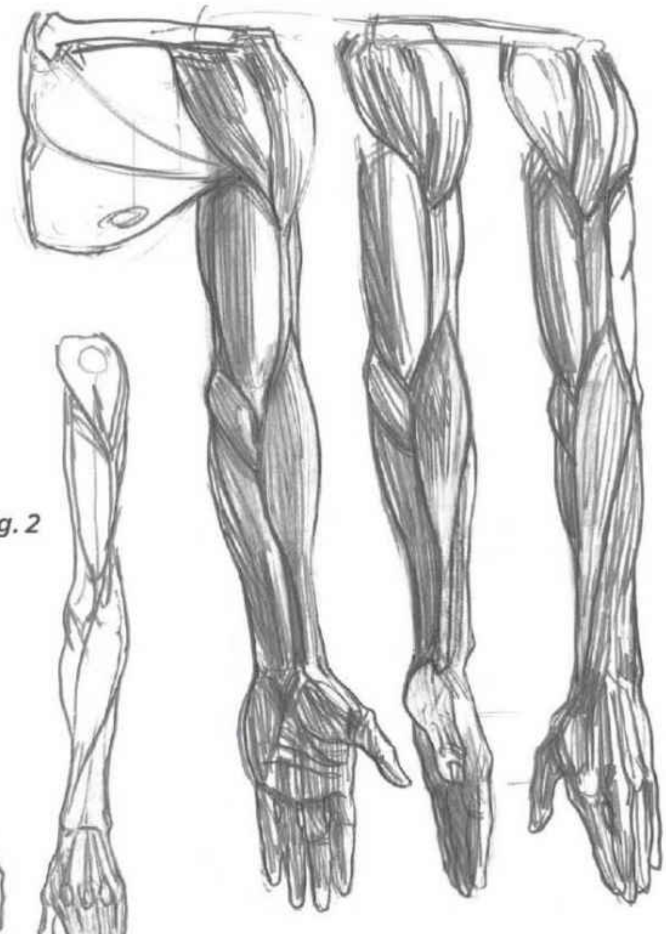
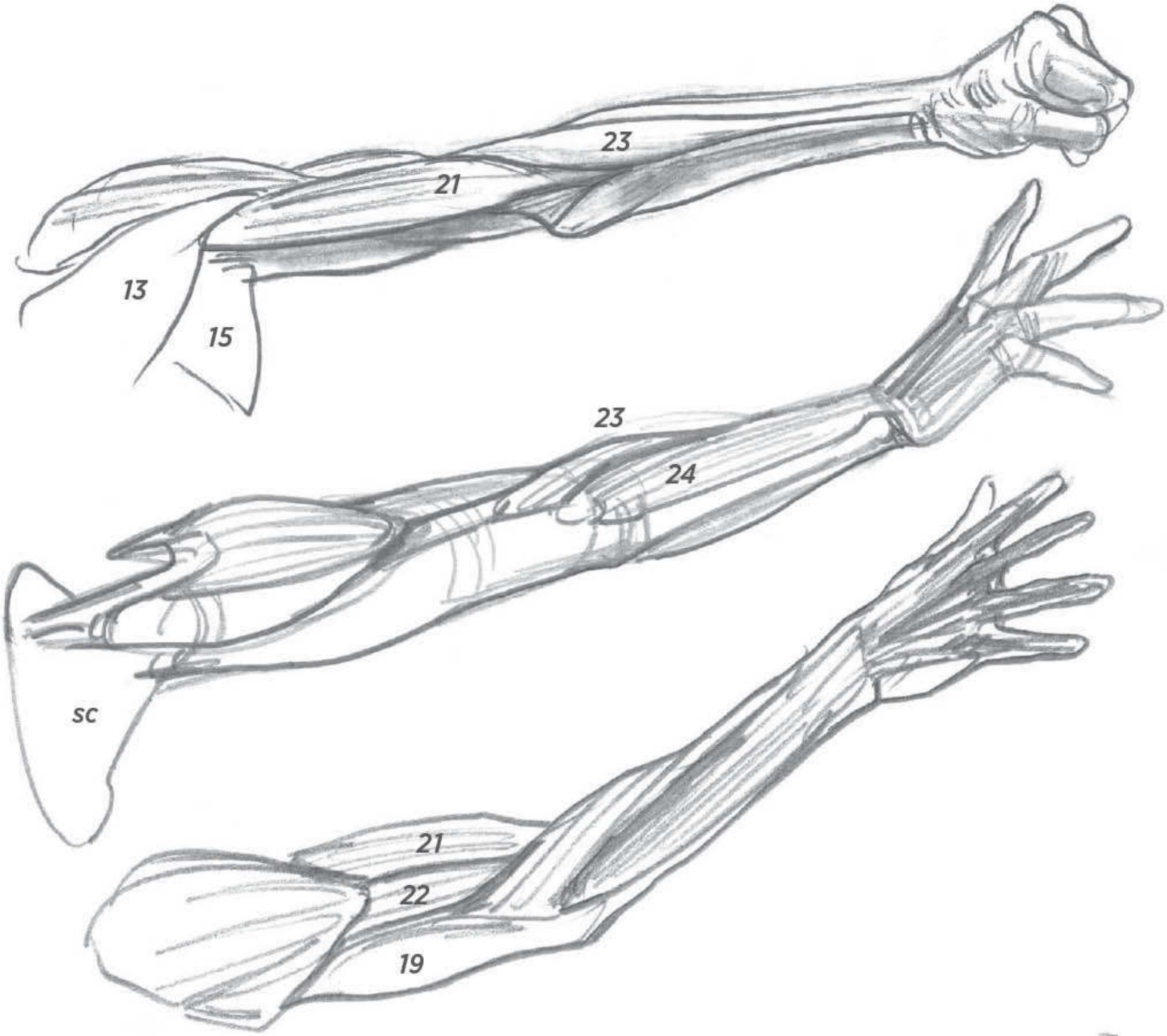
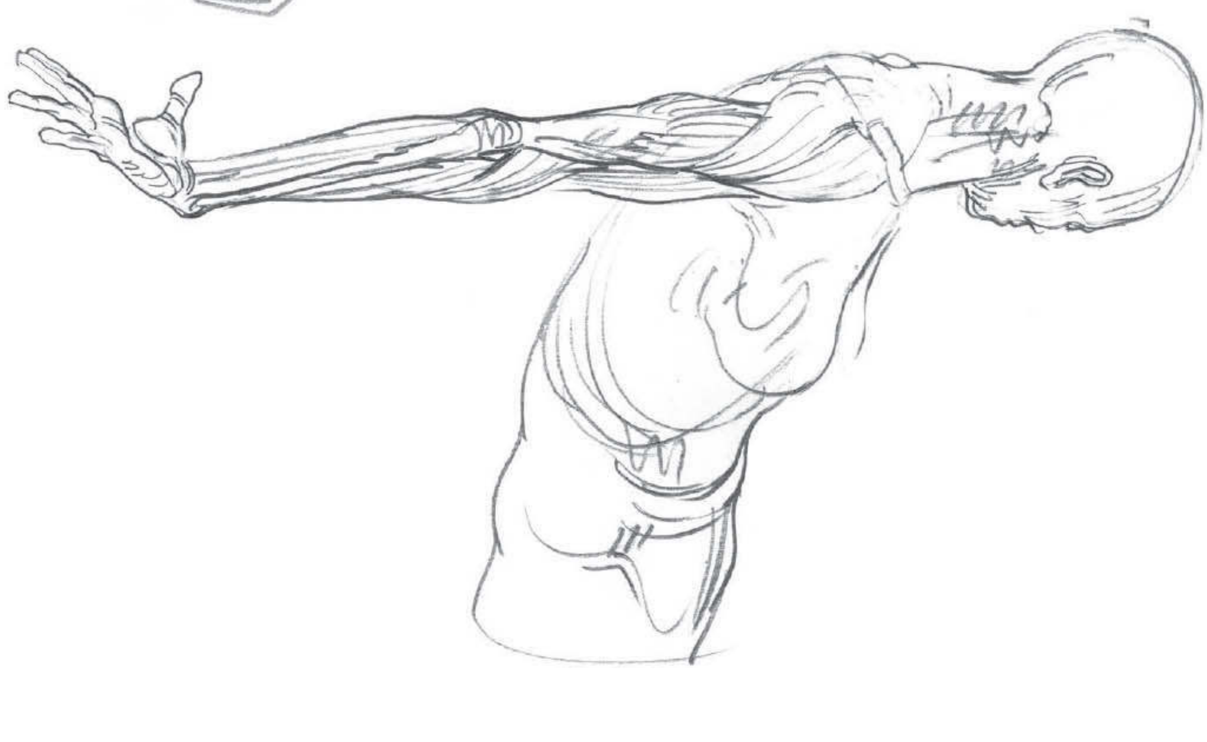


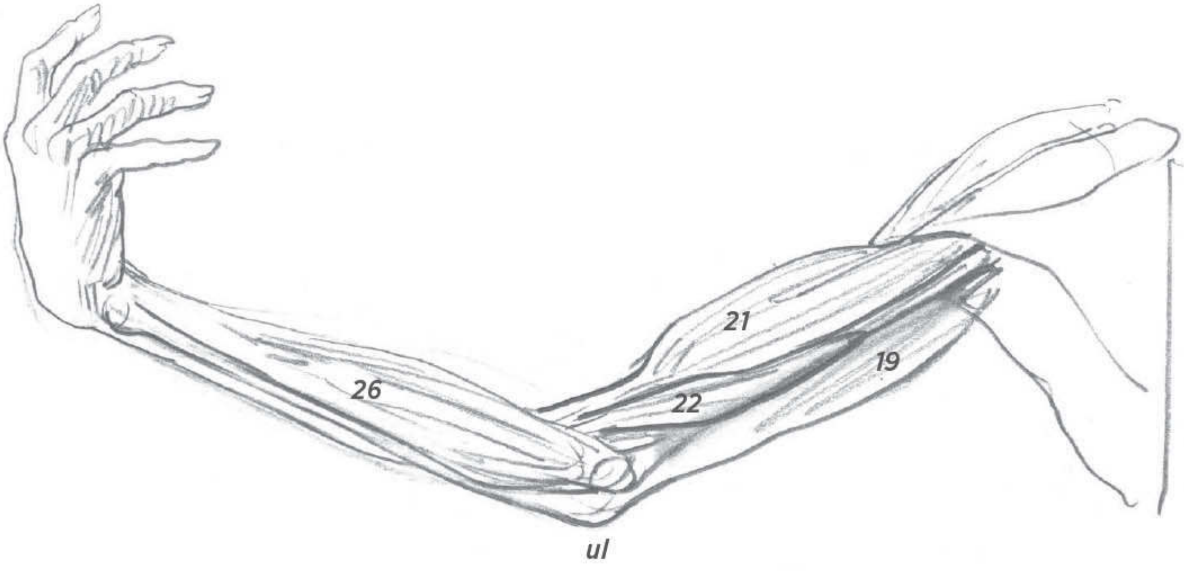
Fig. 2

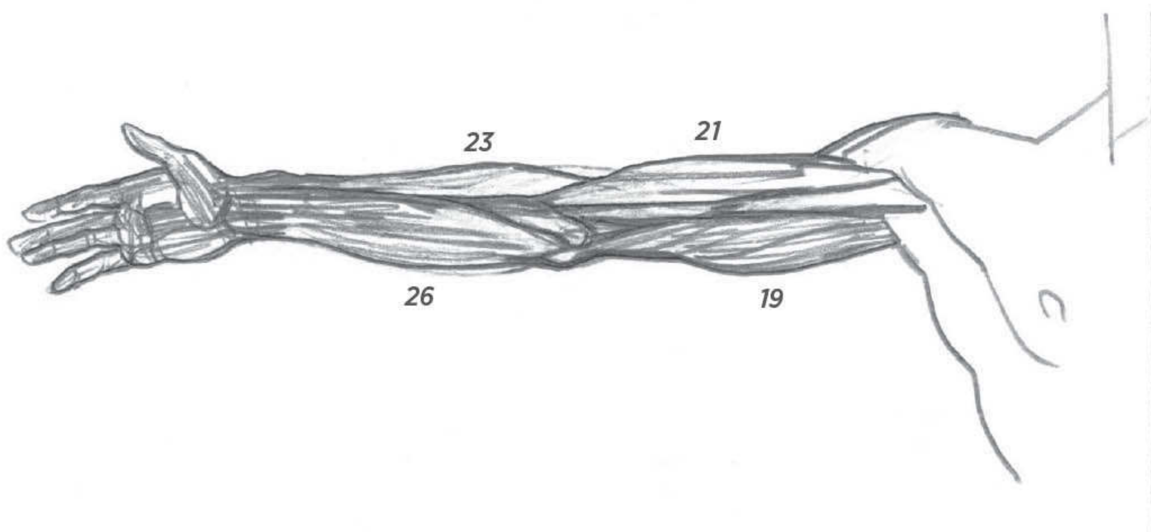


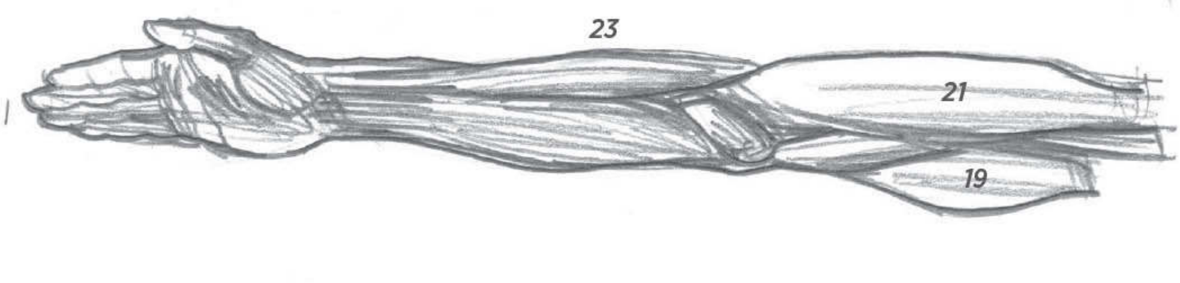
Figs. 1 *and* ***2:*** *The two bones of the forearm are parallel in supination, with the palm forward, the thumb to the outside. In pronation (the opposite position) the two bones are crossed*.

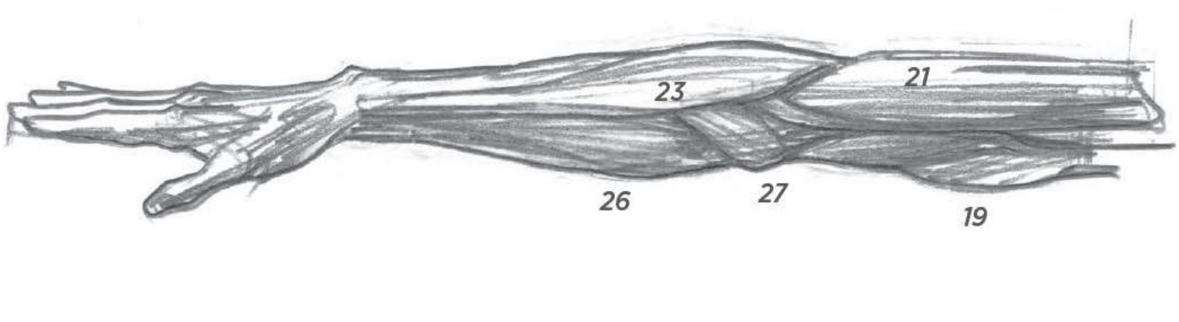

23
21
13
15
23
24
sc
21
22
19

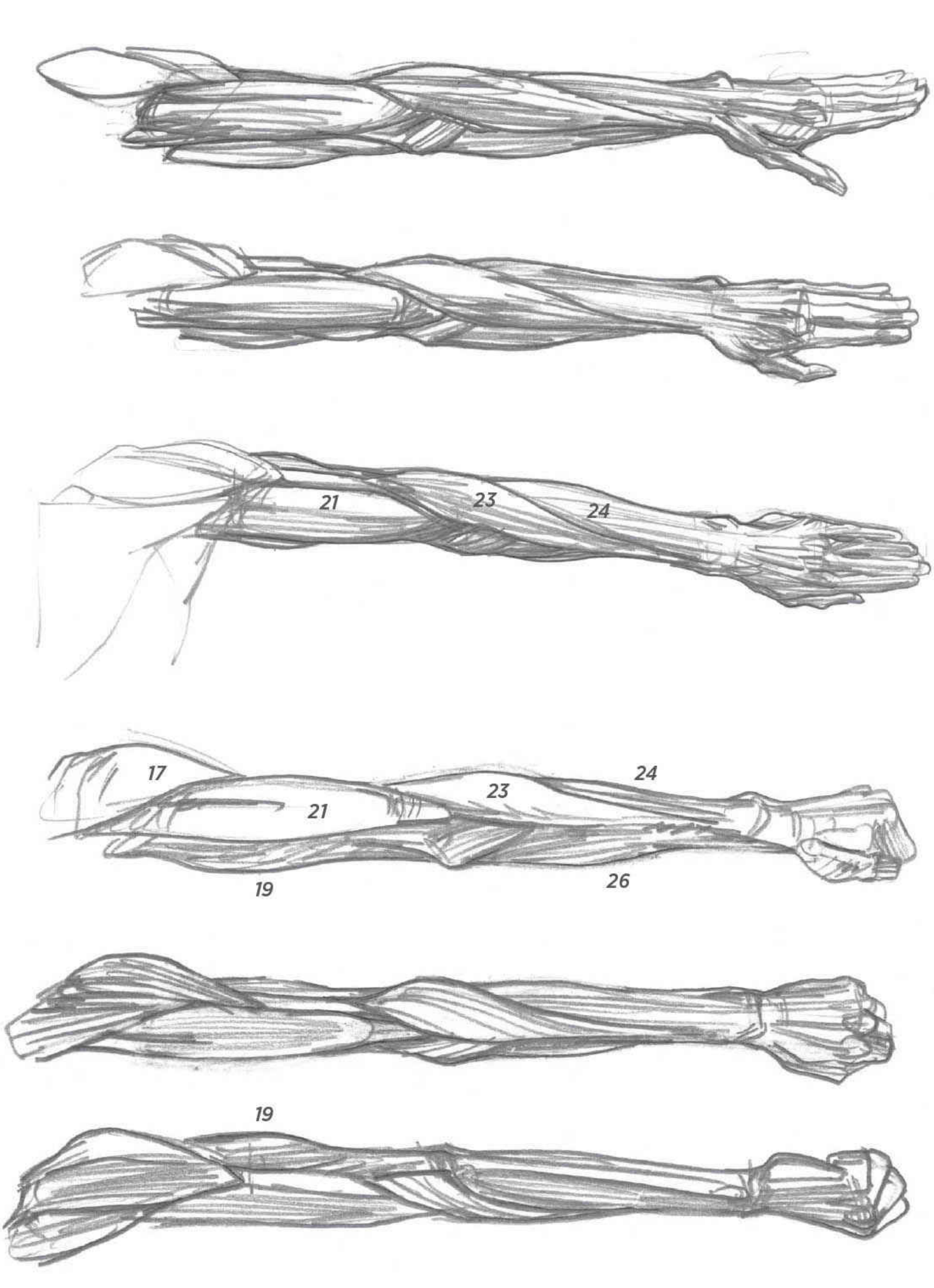



21
19
26
22
ul

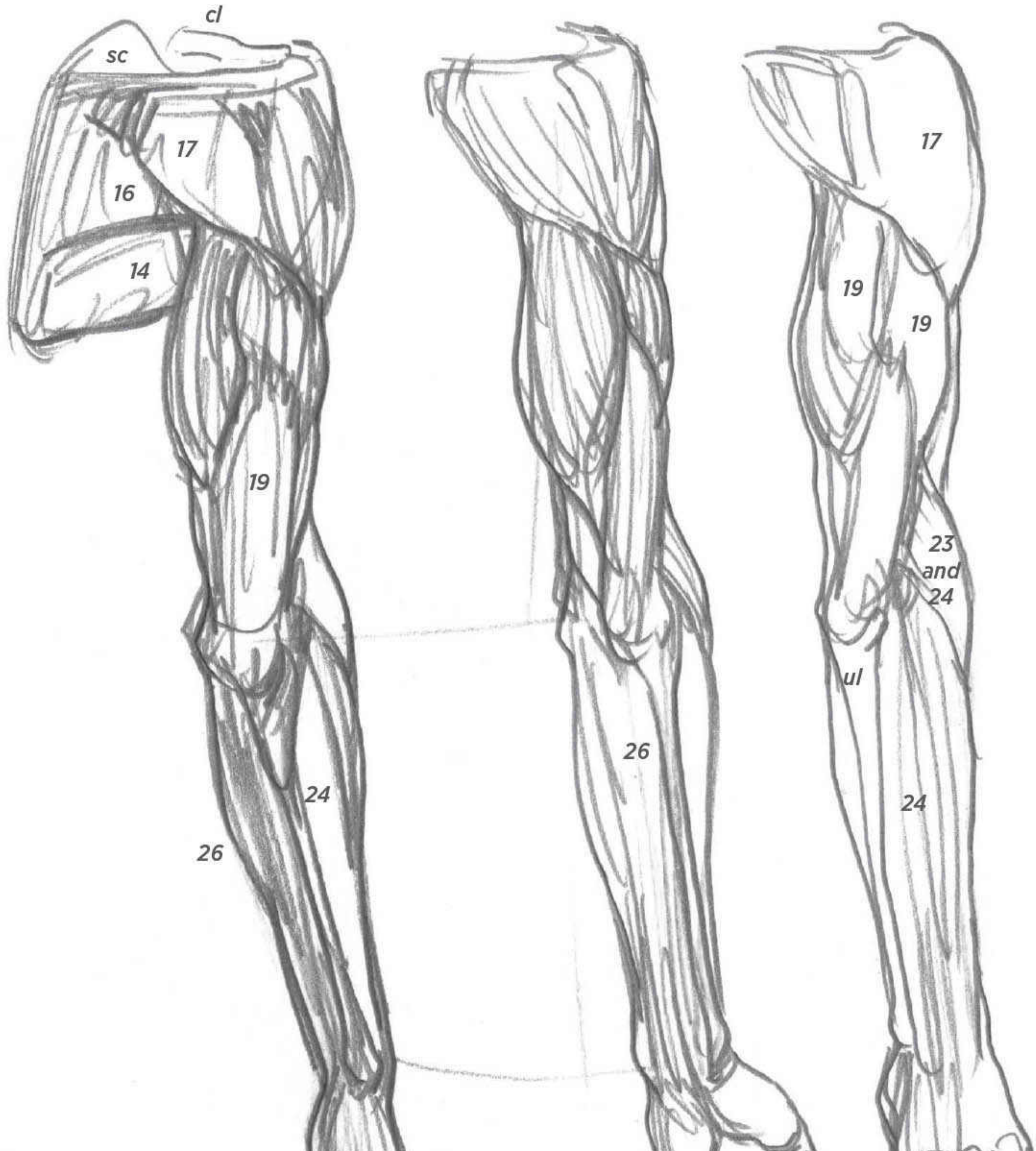

23
21
26
19

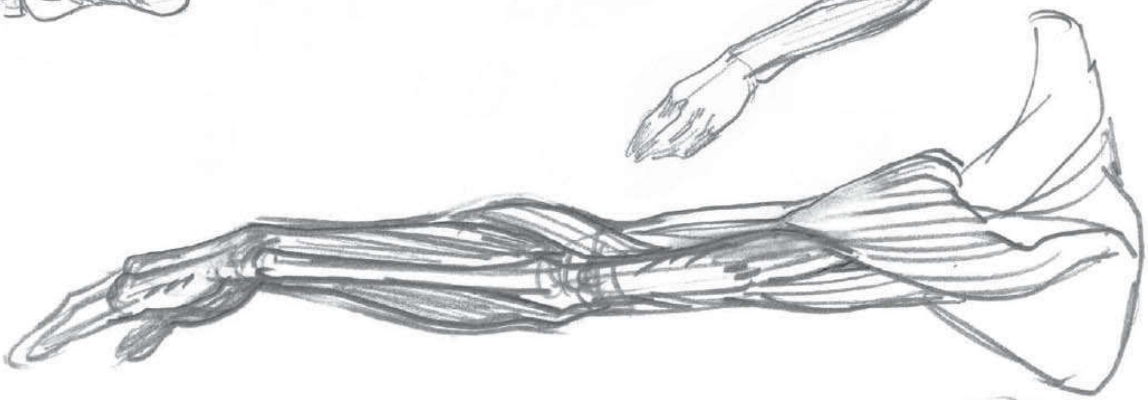

23
21
19

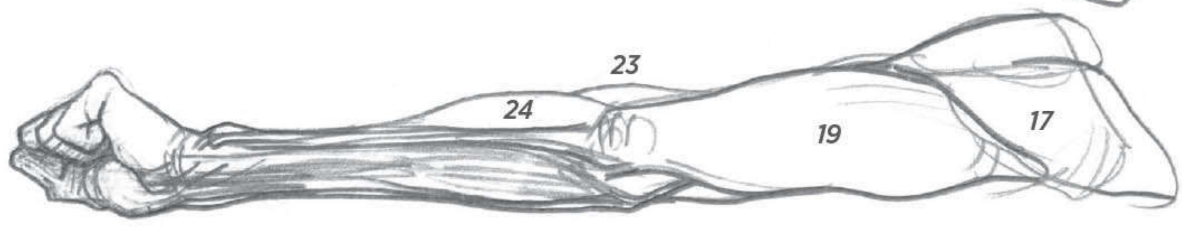

21
23
26
27
19

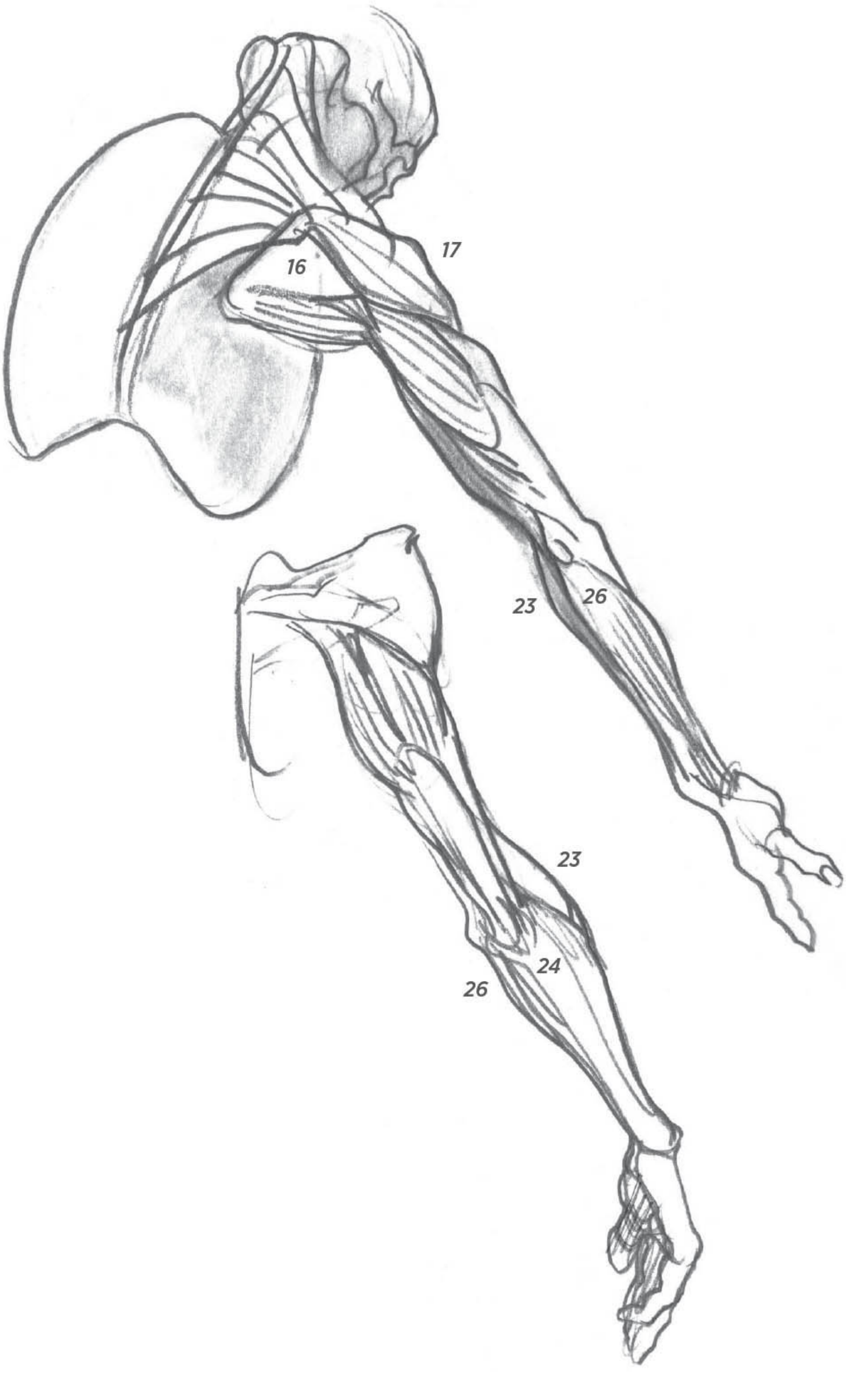


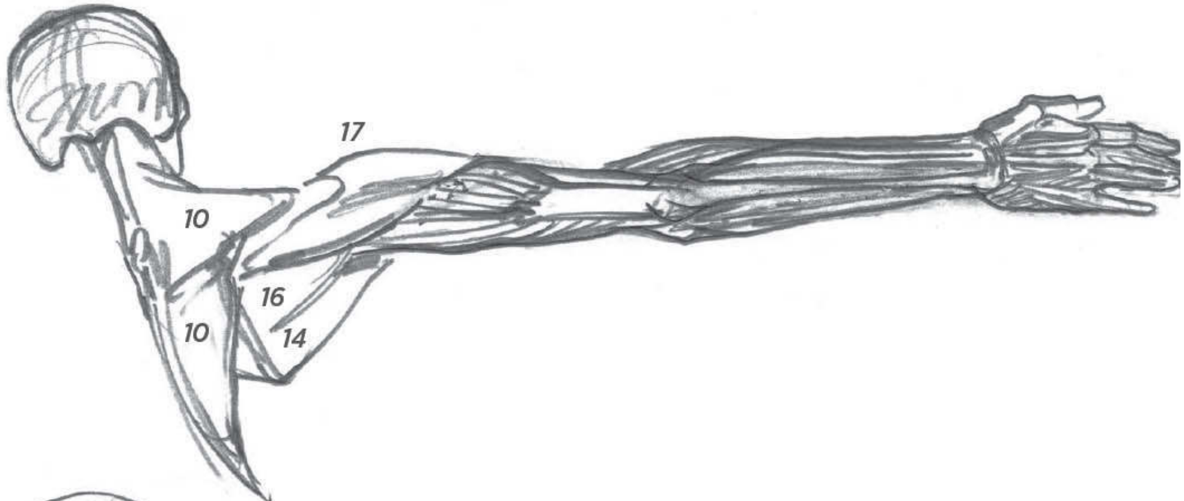
21
23
24
17
24
23
21
19
26
19

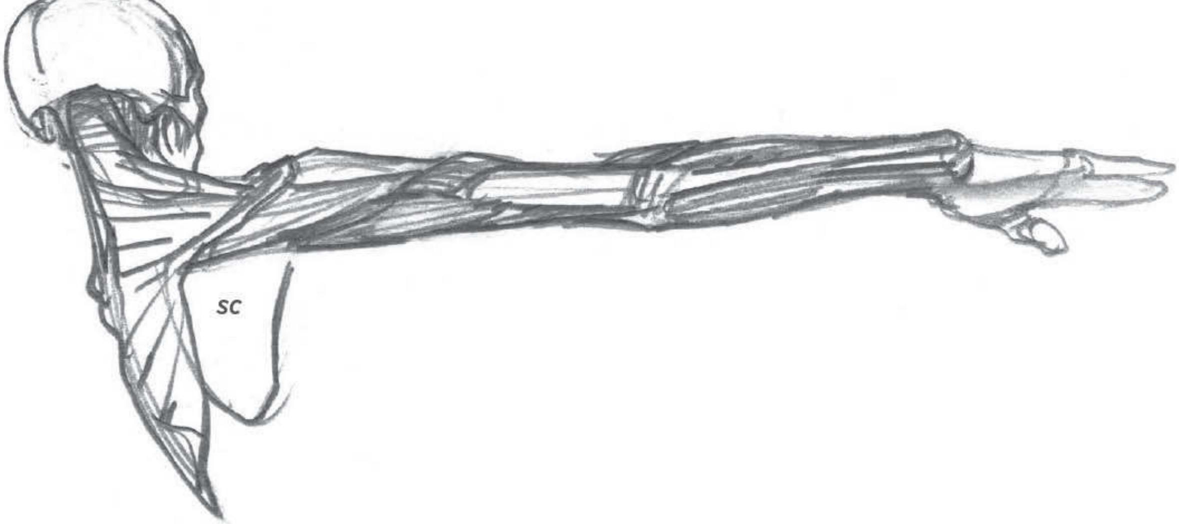

cl
sc
17
16
14
19
24
26
26
17
19
19
23
and
24
ul
24

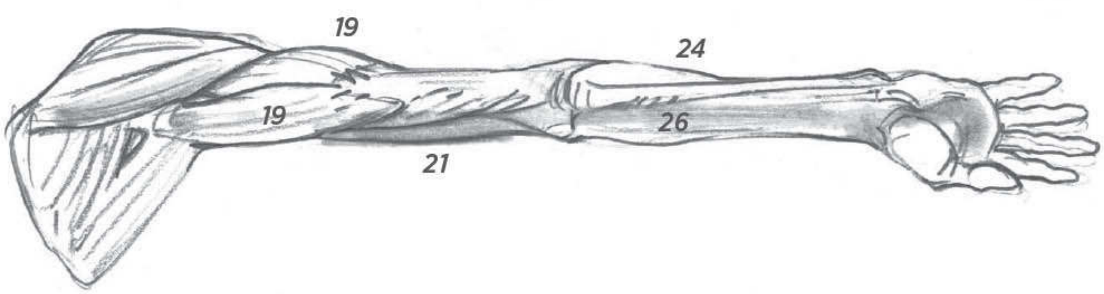


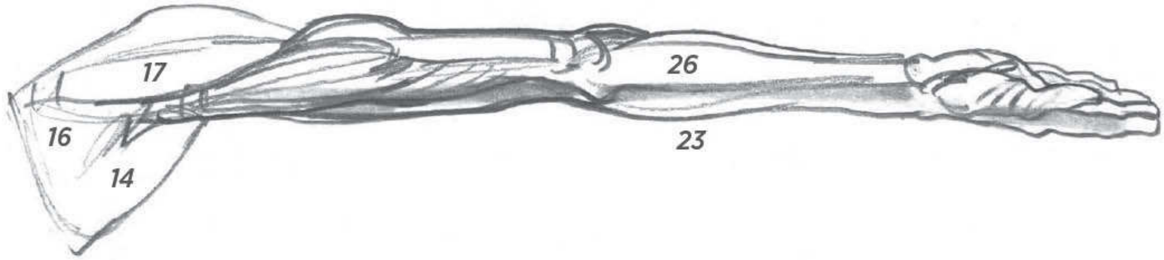

23
24
19
17


17
16
23
26
23
24
26

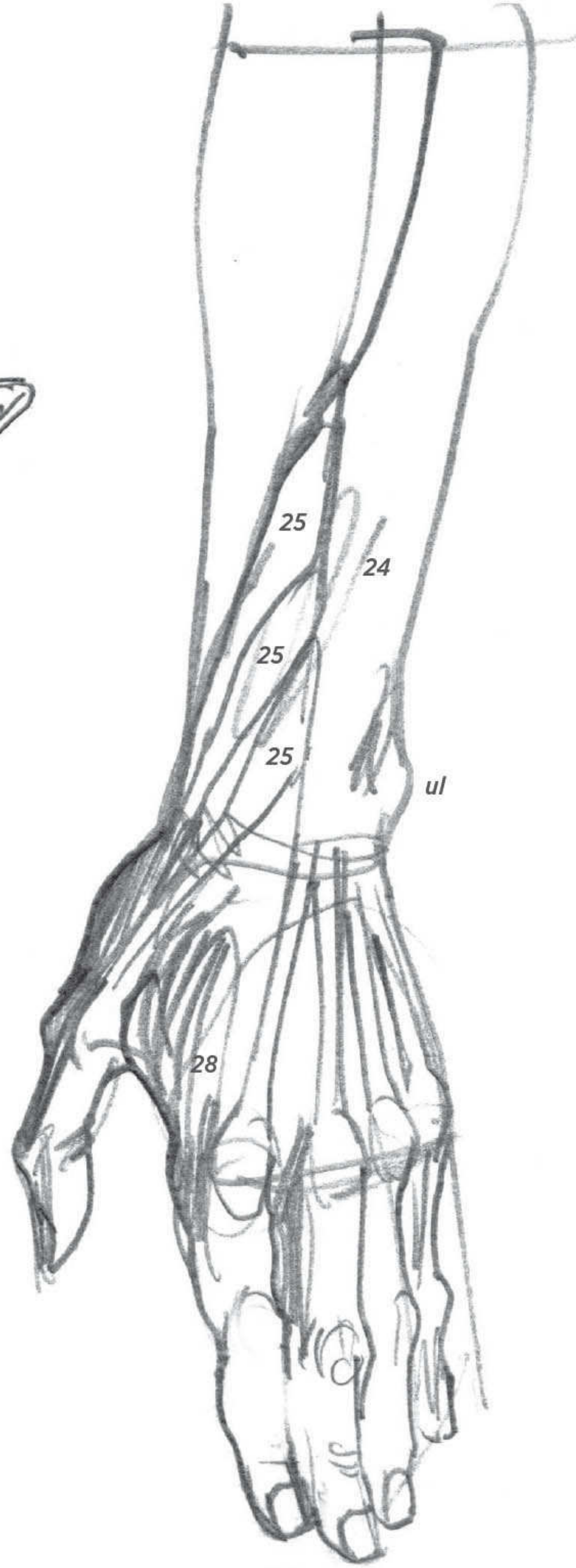

17
10
16
10
14


sc


19
24
19
26
21


17
26
16
14
23


25
24
24
24
23


25
24
25
25
ul
28

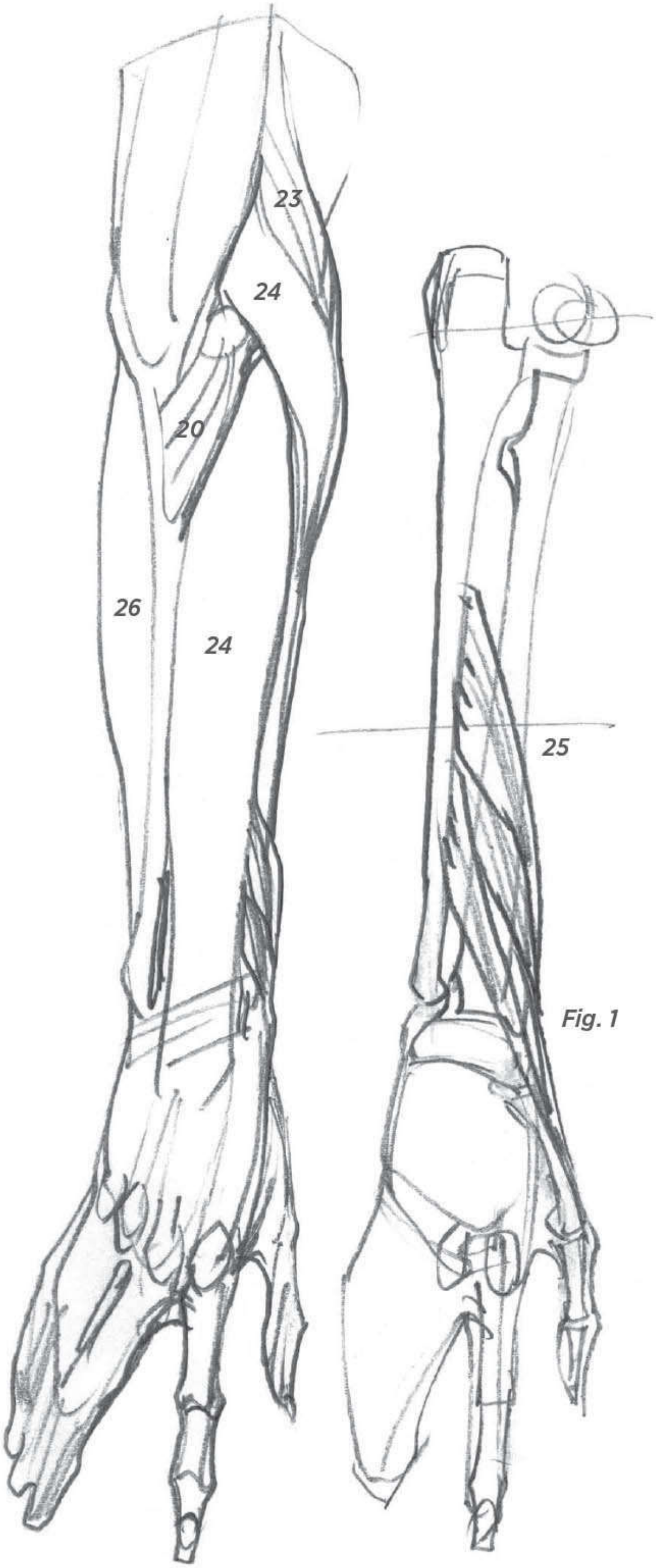
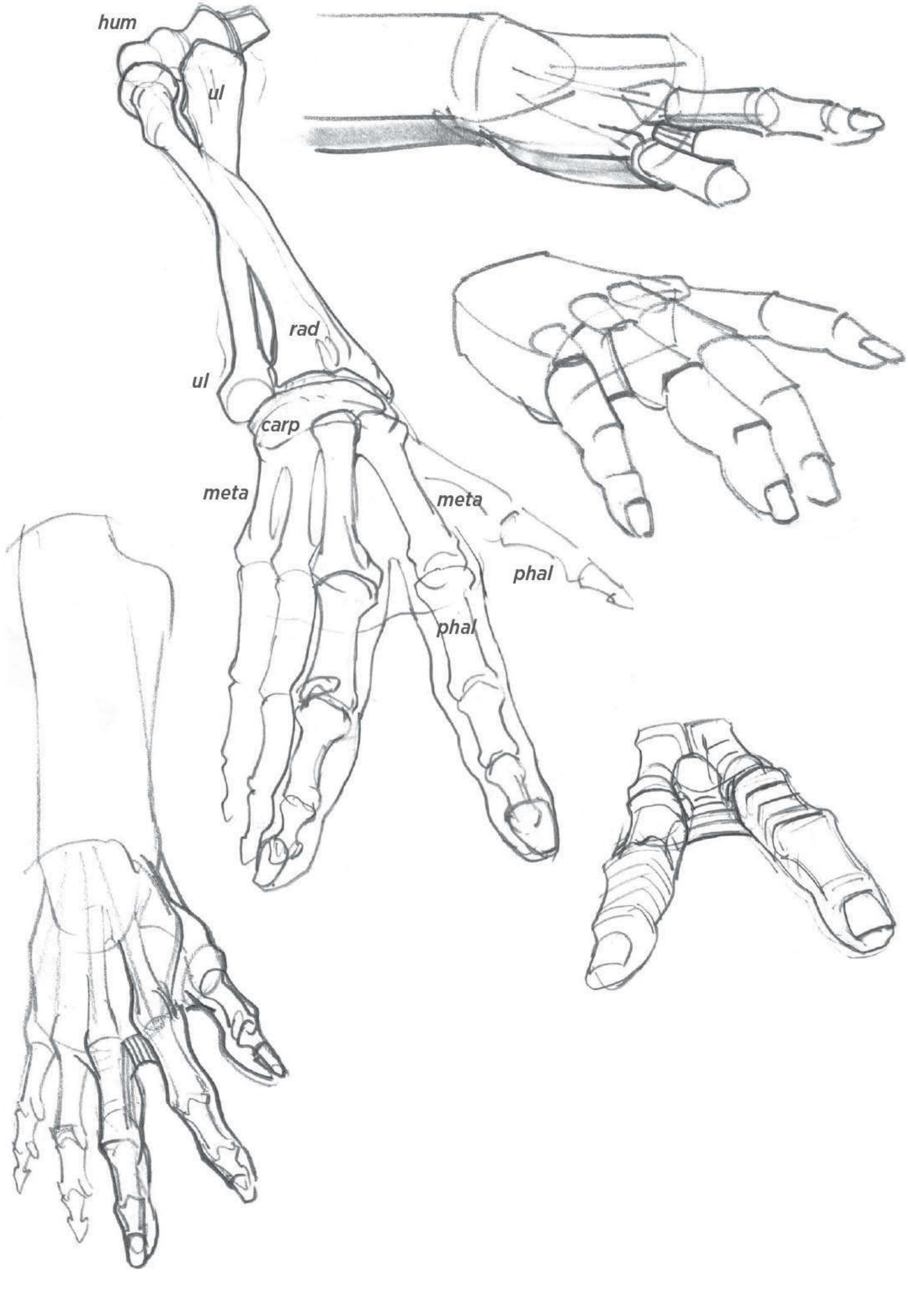


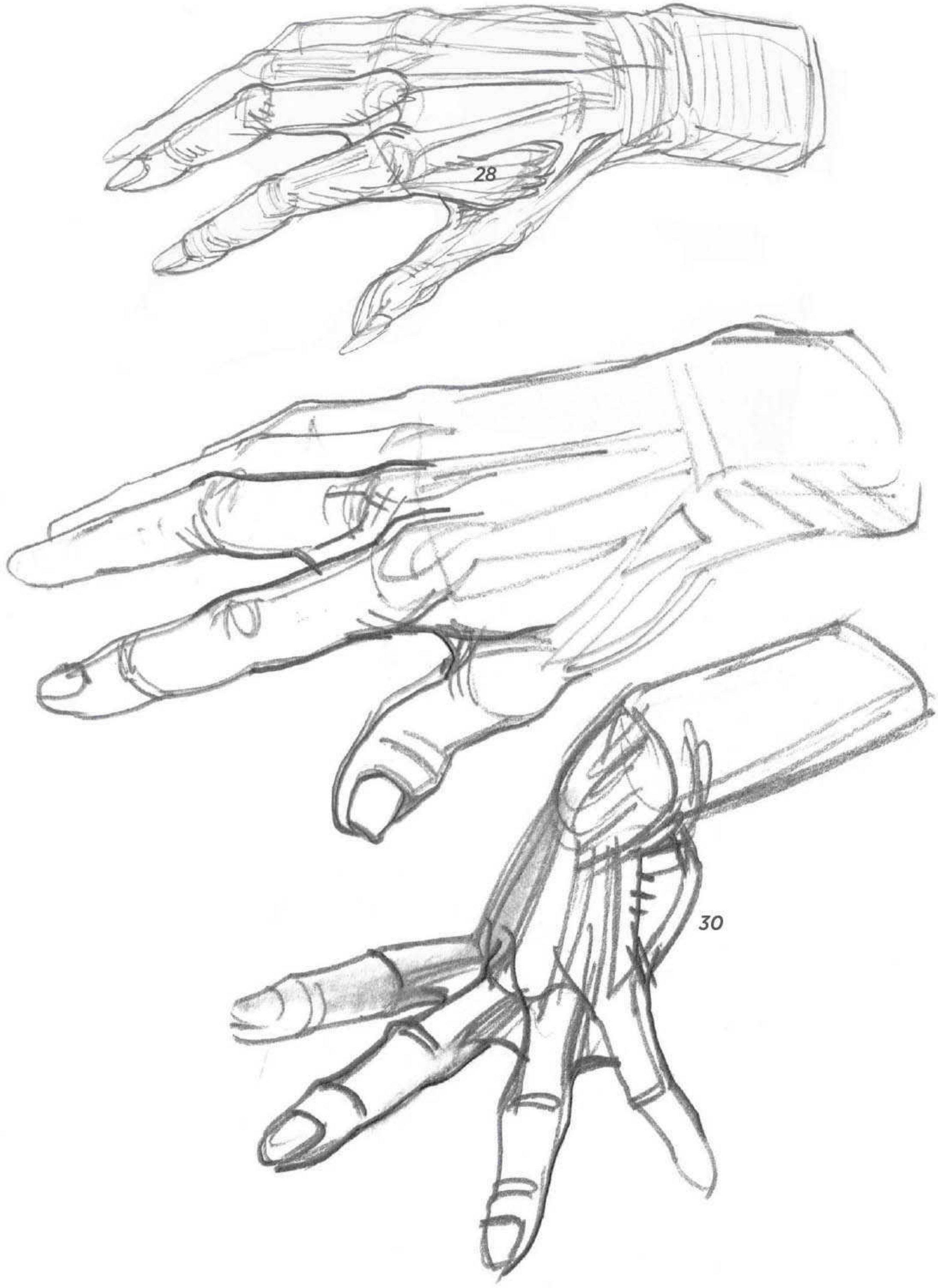
Fig. 1


Fig. 2

Figs. 1 *and* ***2:*** *Group of the thumb extensors.*


hum
ul
rad
ul
carp
meta
meta
phal
phal

The heads of the metacarpals (meta) are protected; on the palm side, by a pillow of fat that creates a space between the underside and top of the hand. This space takes the shape of an intermediate plane between the fingers and explains the webbing, or digital junctures, between the phalanges (phal).


28
30

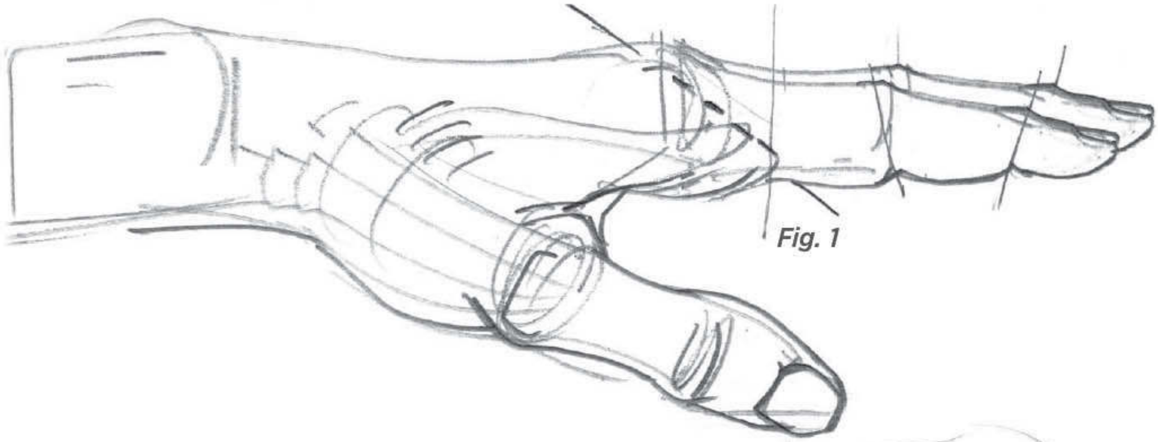


Fig. 1

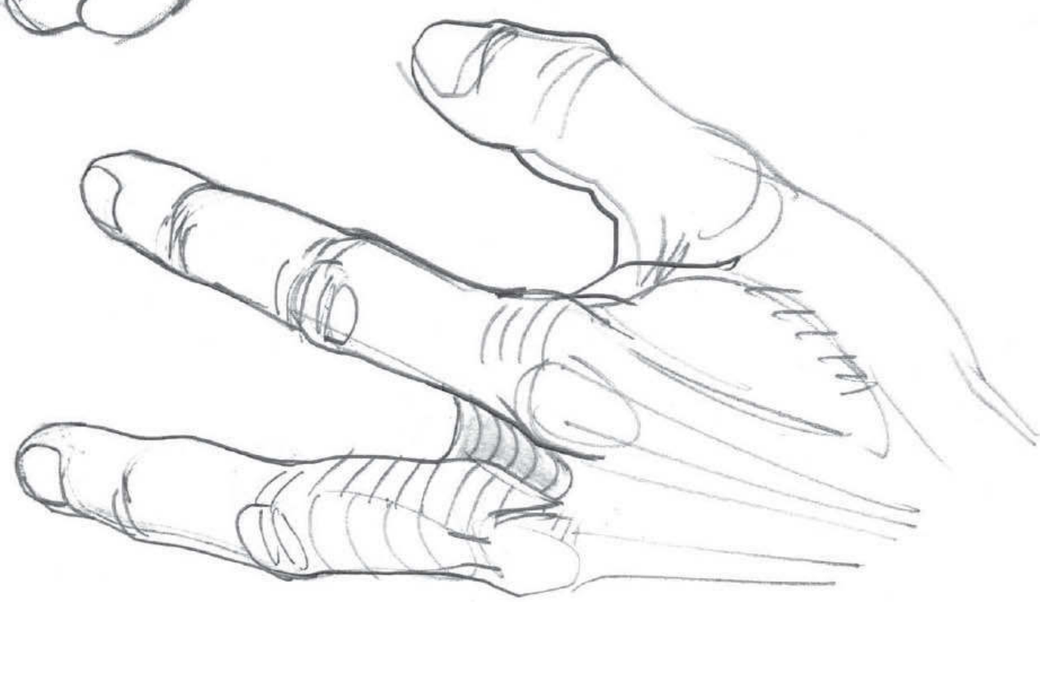


Fig. 1: *Intermediate beveled plane between the fingers (dotted line).*

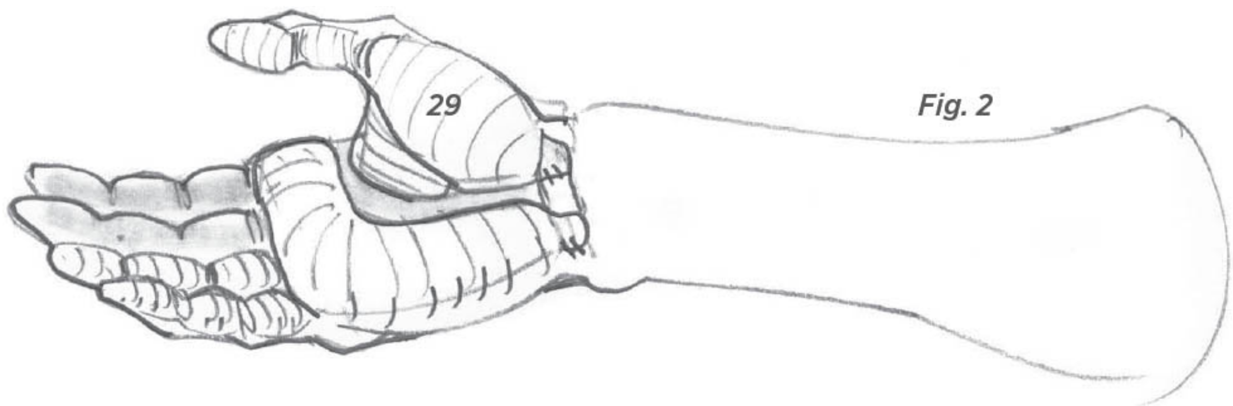


Fig. 2: *Fleshy volumes of the palm. On the thumb side, the flexor muscles (29) comprise the dominant shape. On the other side, the flexors of the little finger melt into the fat, which slides under the heads of the metacarpals. The underside of each phalange is covered in little pillows of fat.*

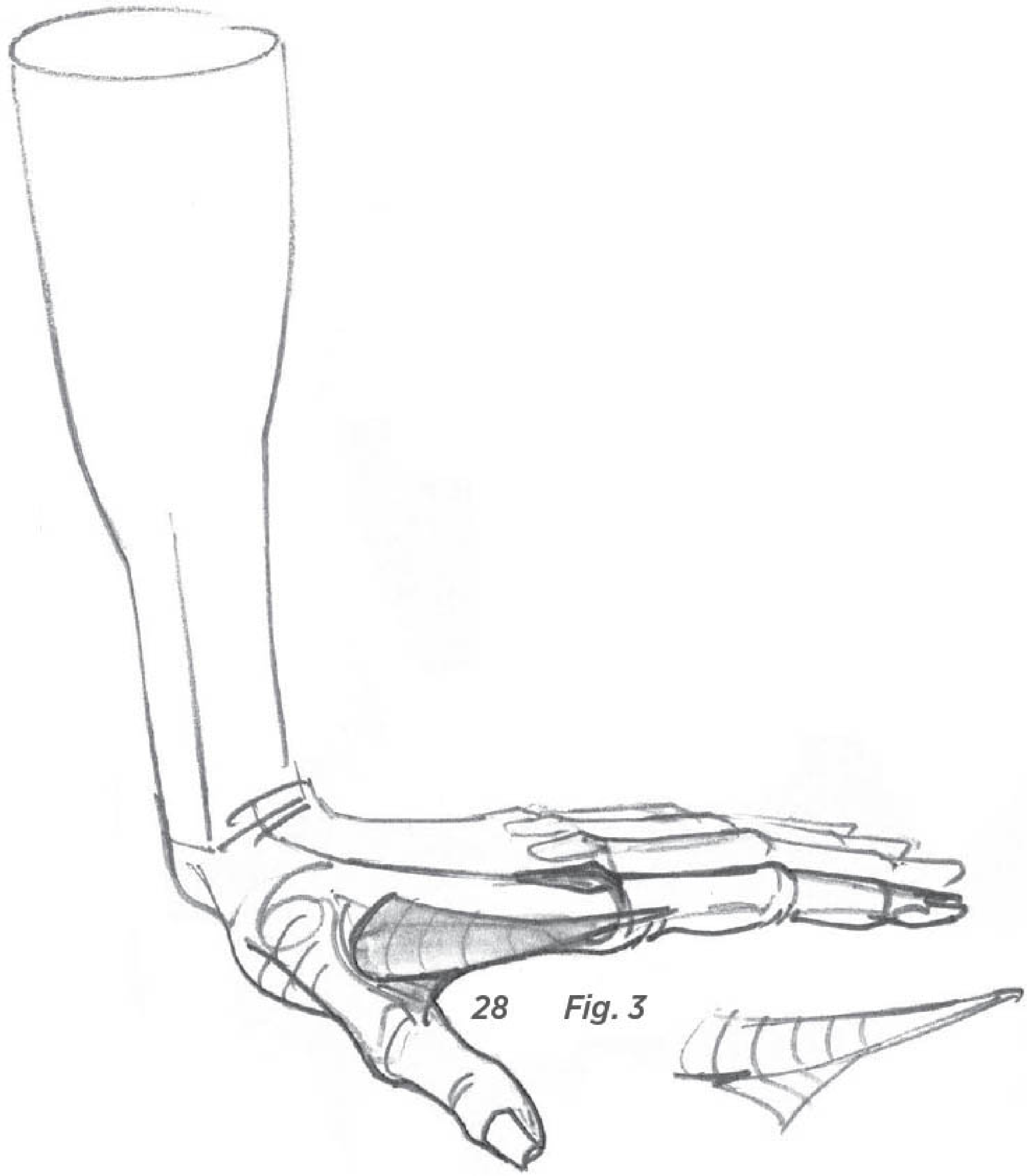


Fig. 3: *Diagram of the interosseous muscles (28).*

Fig. 4

Fig. 4: *In flexion, the carpal bones are outlined in the contour of the hand.*

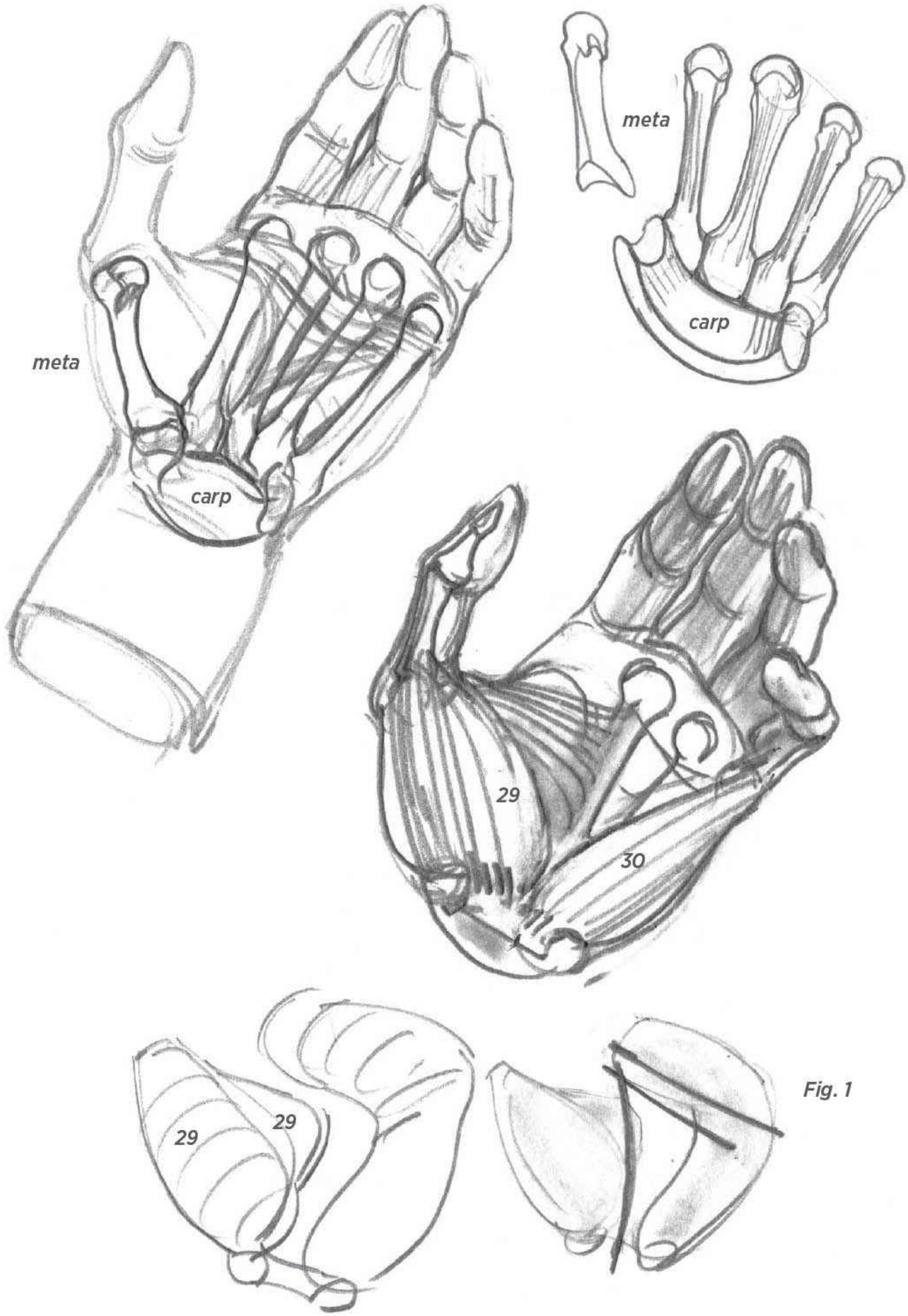


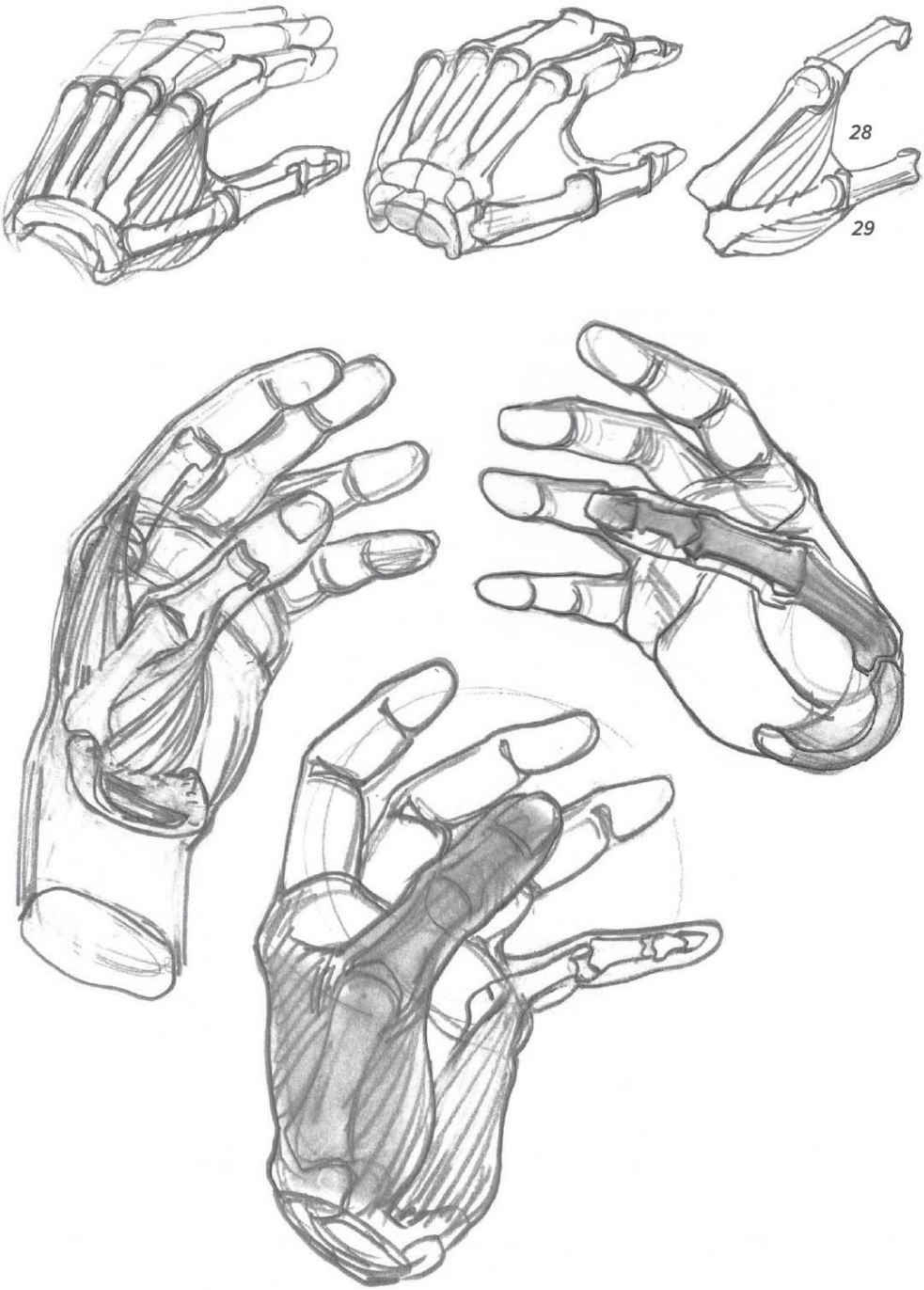
Fig. 1

Fig. 1: *The lines of the hand correspond to the folds of the thumb and the fingers.*

Fig. 2: *The likenesses between the hand and the foot.*

Fig. 3

Fig. 3: *The palm is entirely muscular at the base of the thumb. Its outside edge, starting as muscle at the carpal bone, becomes fatty under the heads of the metacarpals.*


28
29

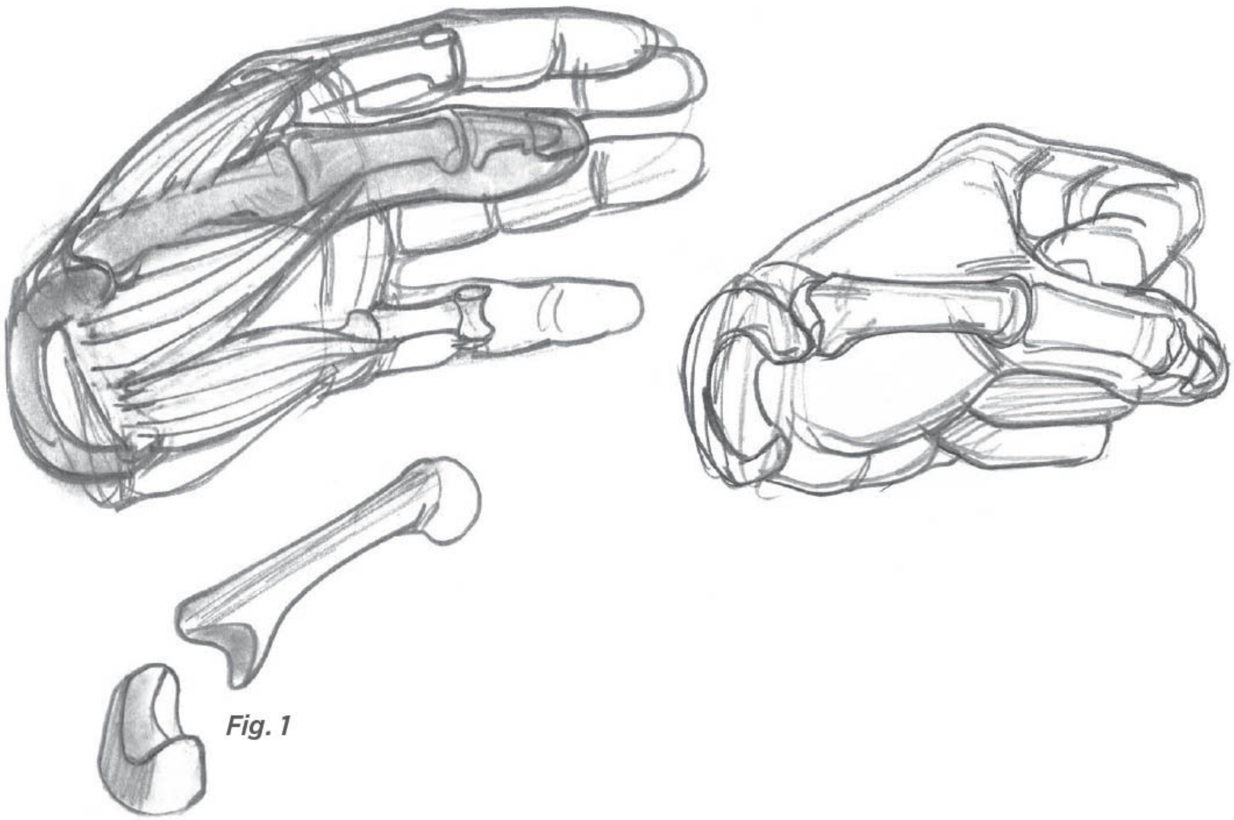


Fig. 1: *The thumb's saddle joint*.

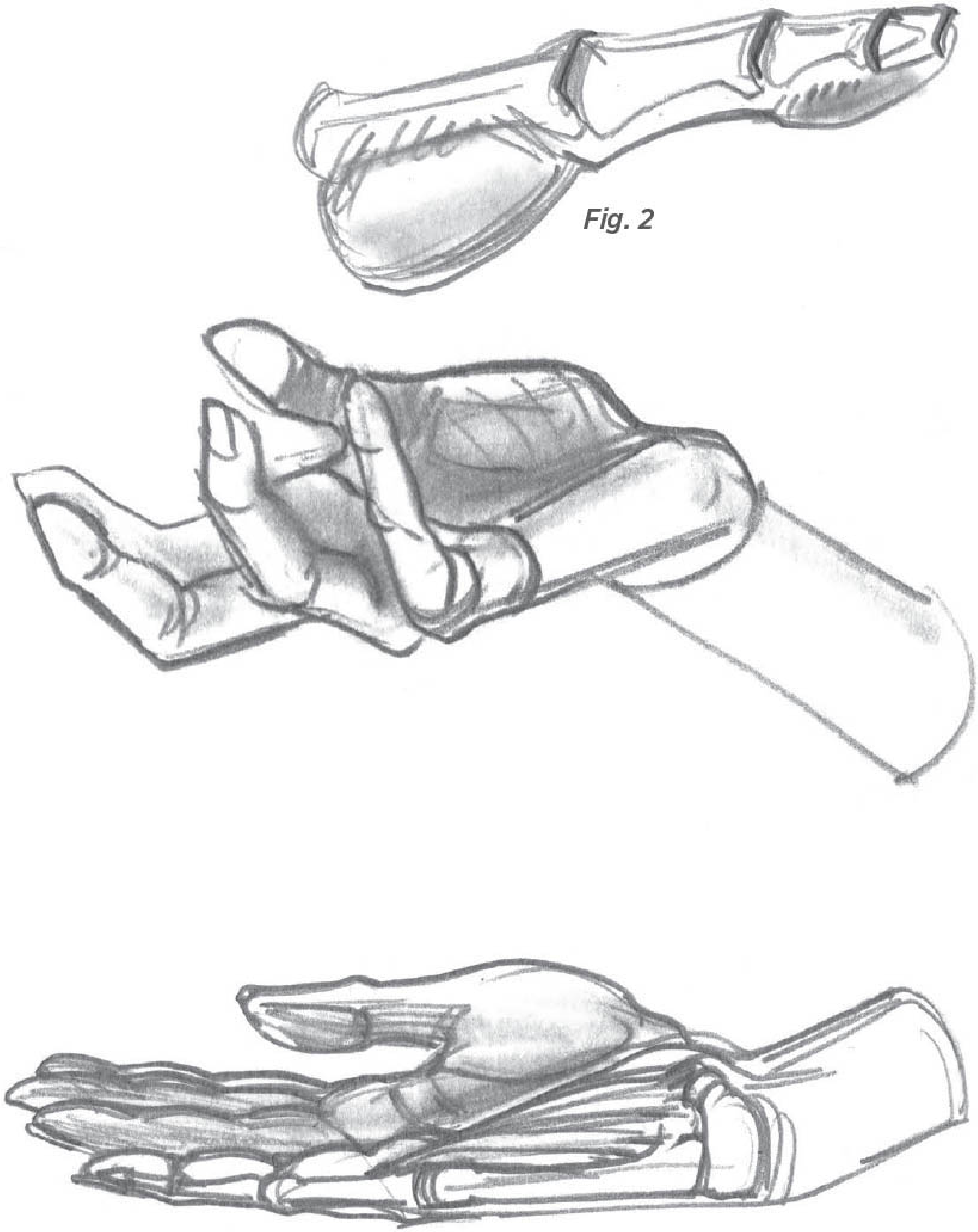


Fig. 2

Fig. 2: *Joint and nail folds, simplified.*

Fig. 3

Fig. 3: *Cushion of fat at the tip of the thumb*.

Fig. 1

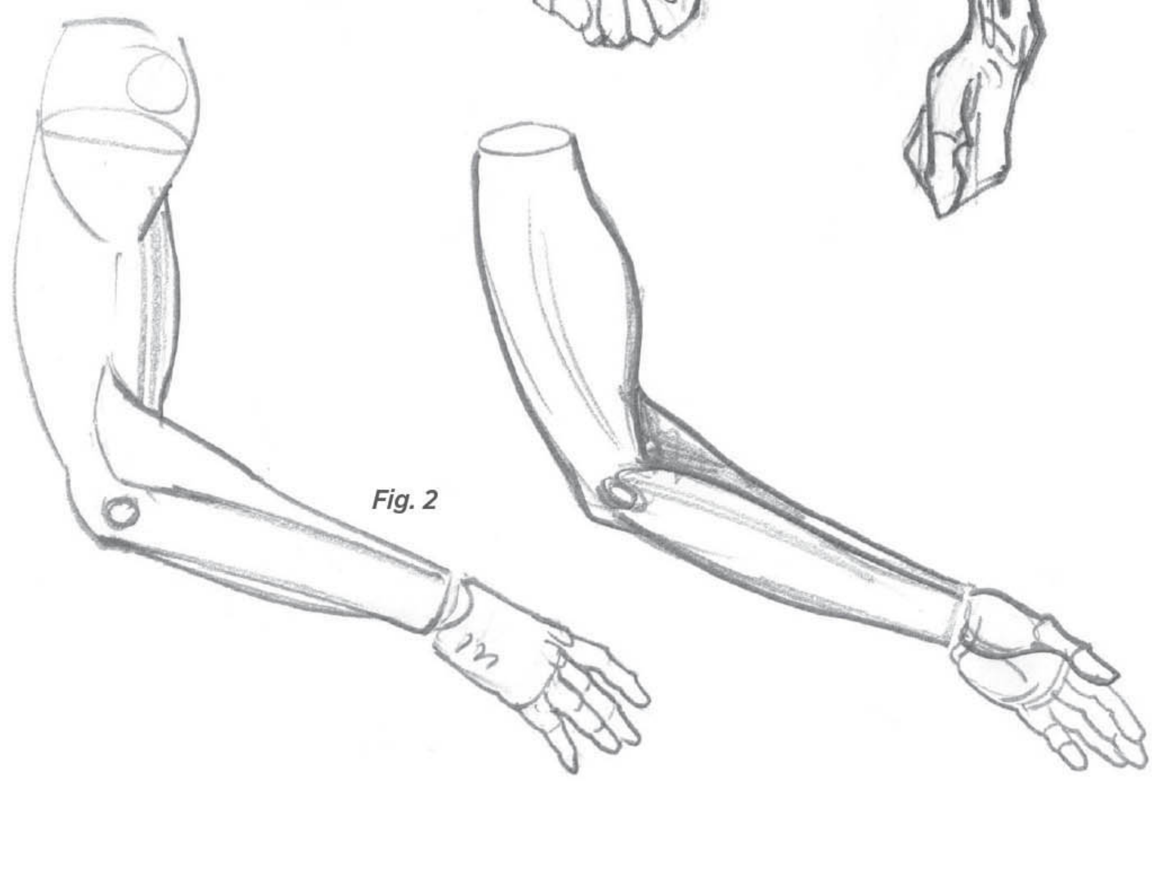


Fig. 2

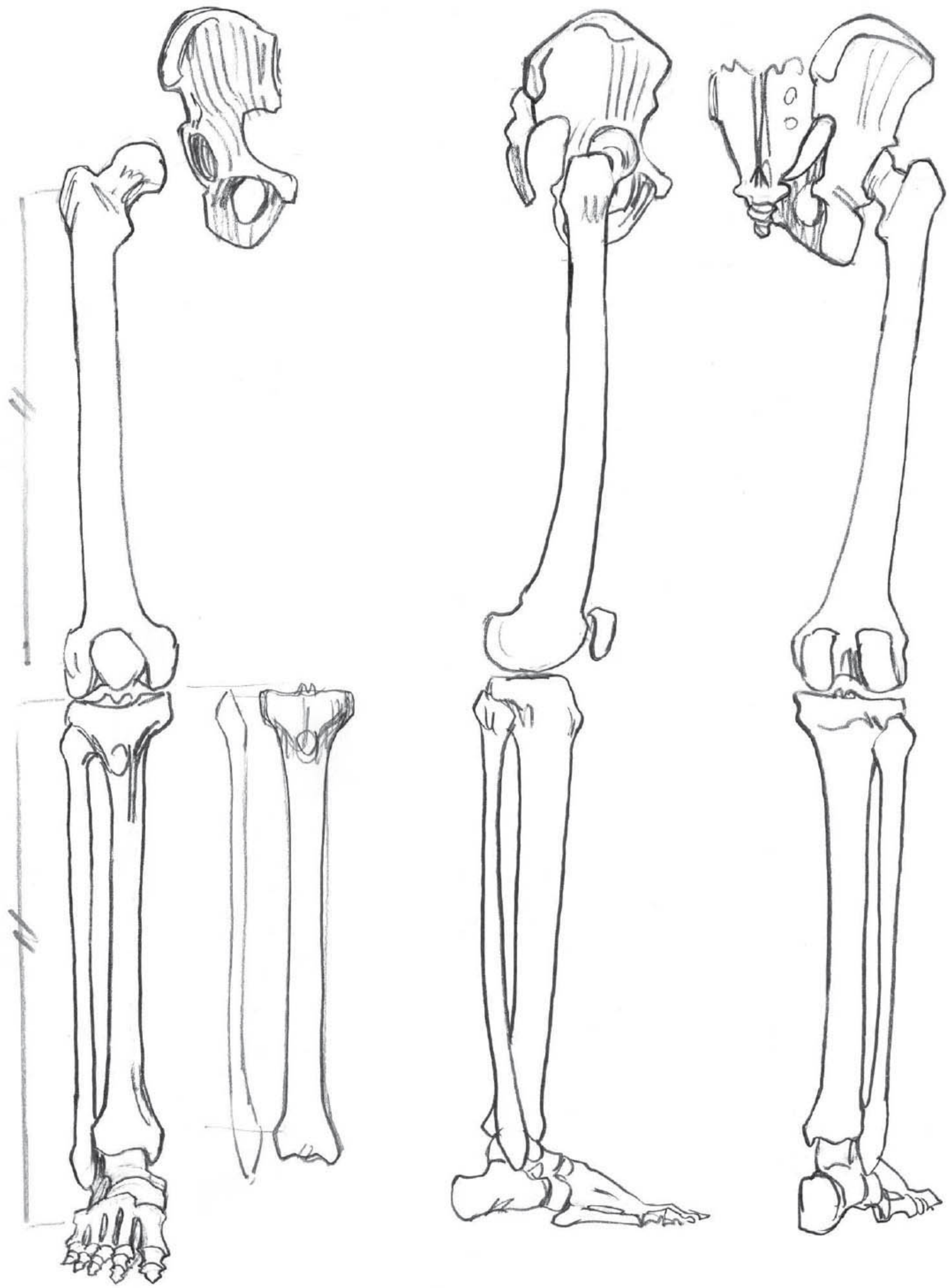
Complete Versions of the Upper Limb:

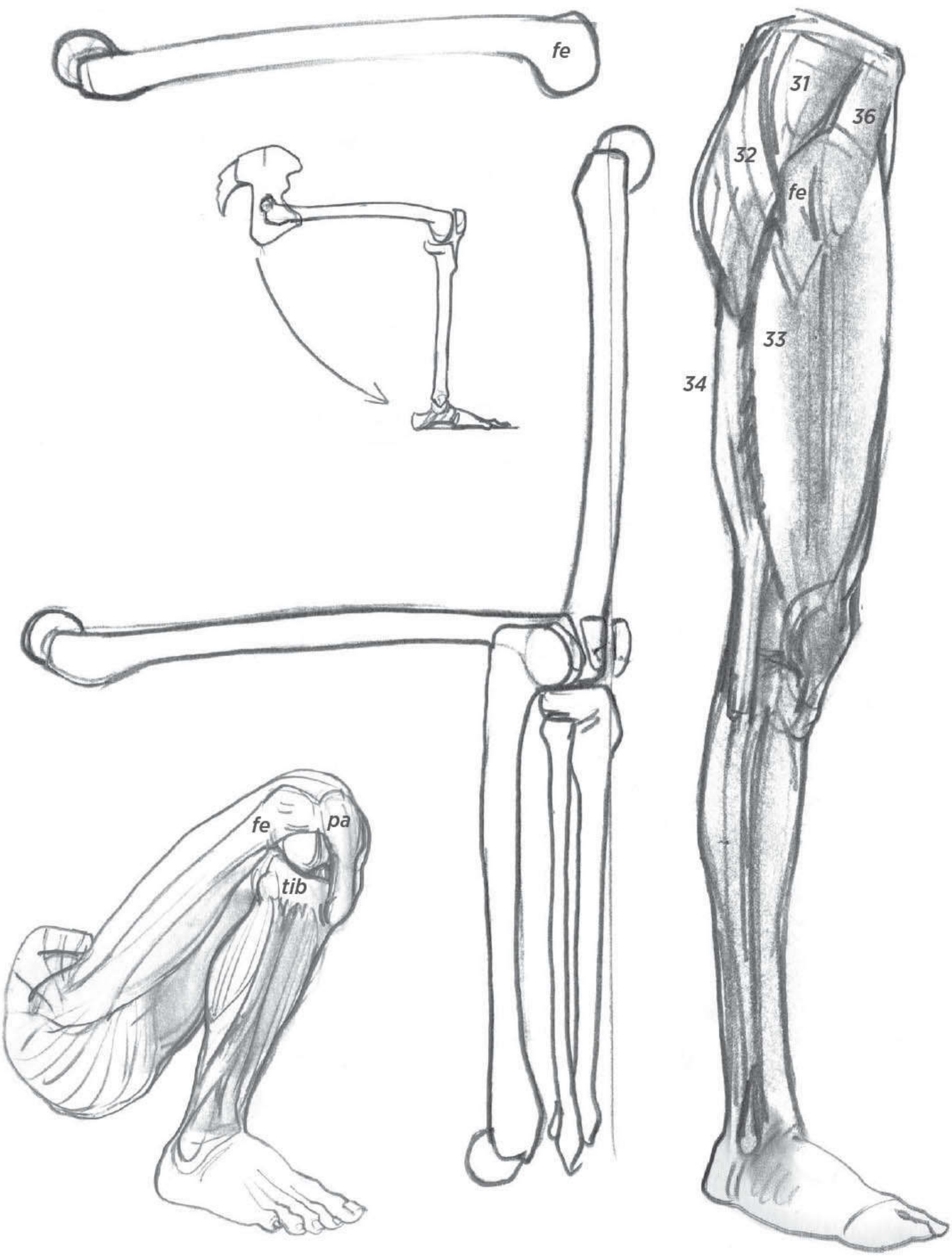
Fig. 1: *Arm and forearm intersect in an oval. At the level of the elbow, their axes are offset by ninety degrees. The forearm, fleshy near the elbow, flattens out and becomes bony near the wrist*.

Fig. 2: *The brachioradialis forms a muscular wall during flexion, which makes it possible to distinguish between the external and internal views. At the level of the elbow, the biceps slides to the interior while*

the brachioradialis remains on the exterior.

lower limb





Proportions: *The length of the femur is equal to that of the tibia added*

to the height of the foot. When the limb is bent, the heel touches the buttocks.

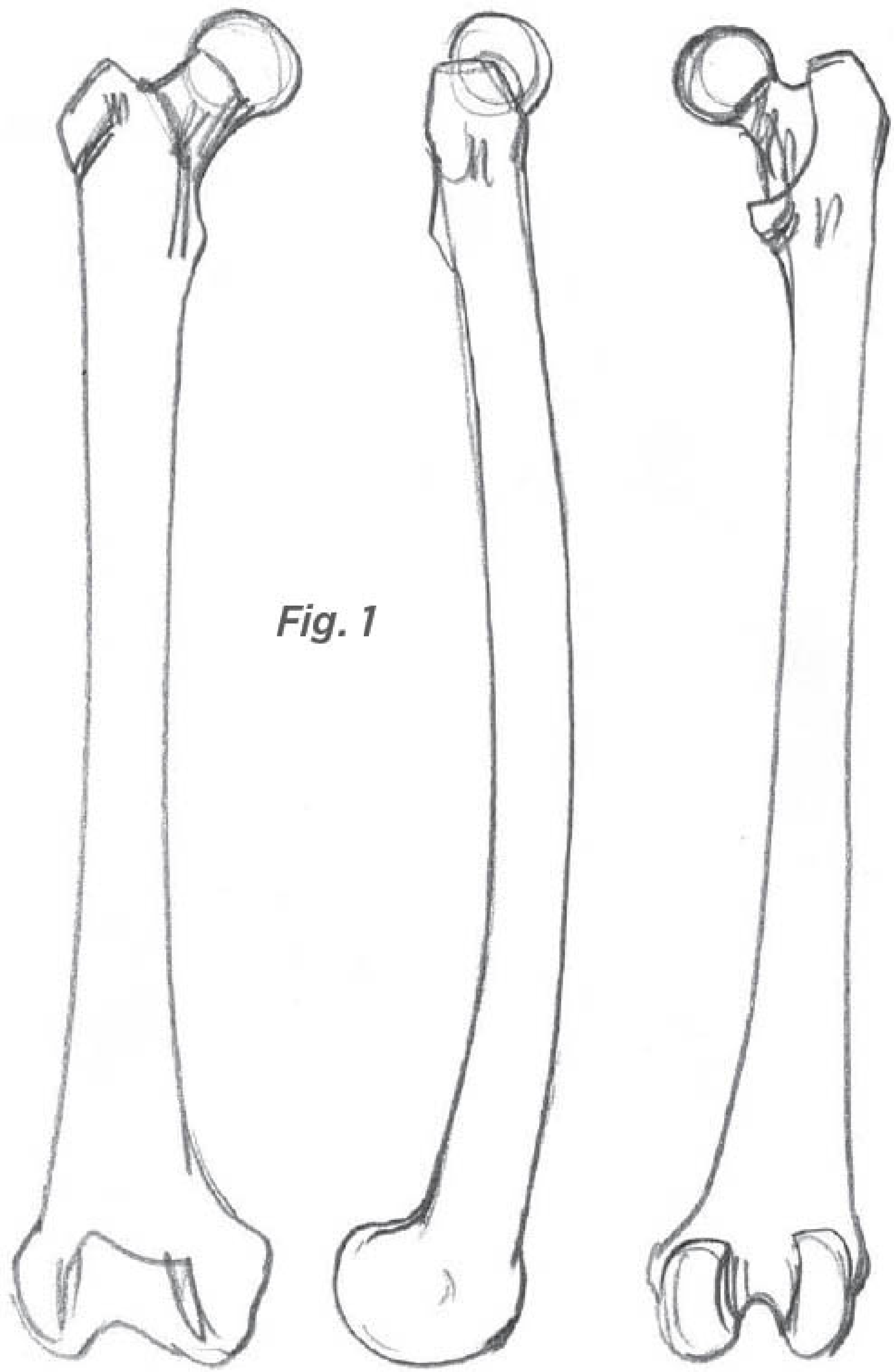
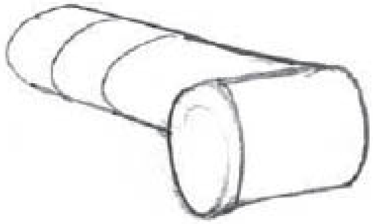


Fig. 1

Fig. 1: *Femur from the front, profile, and back.*



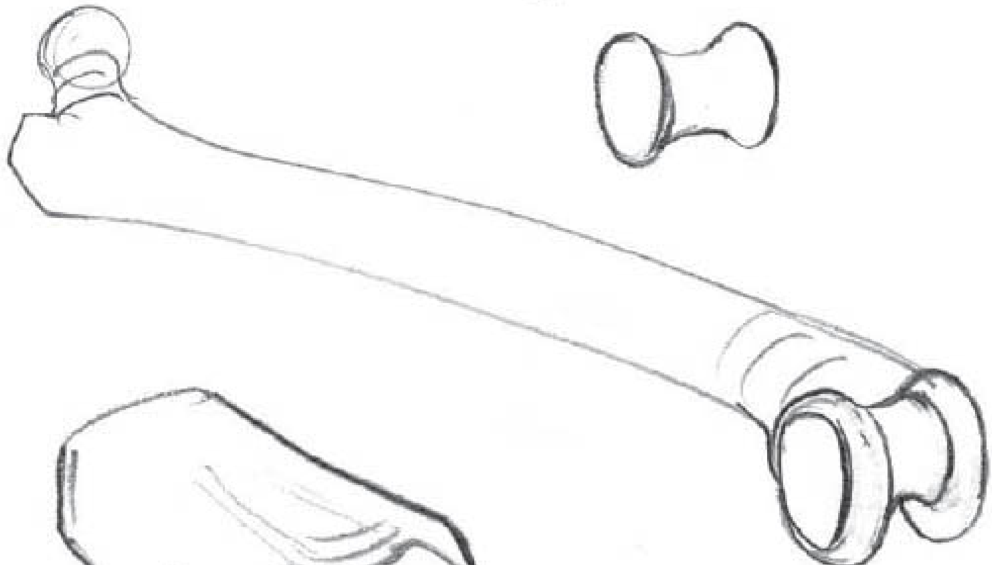


Fig. 2

Fig. 2: *Diagrams of the lower tip of the femur.*

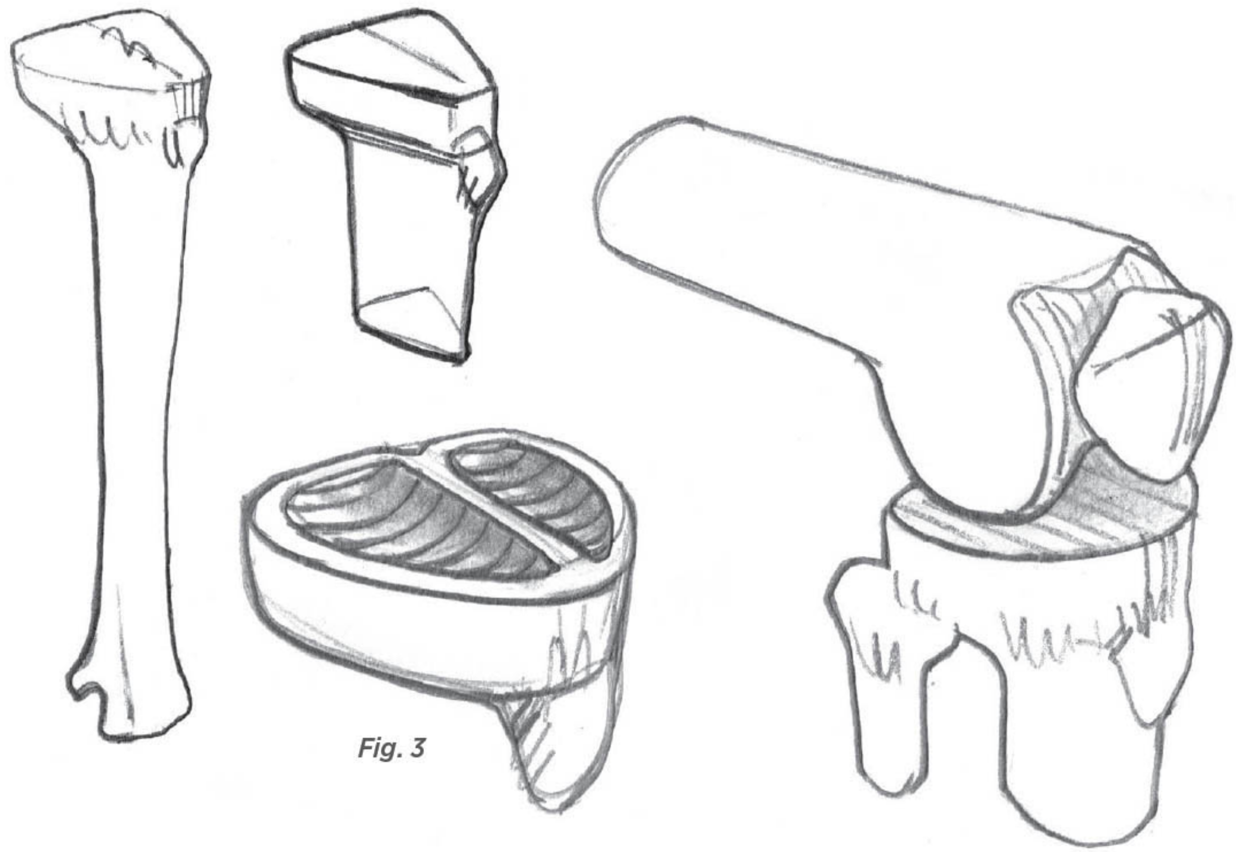


Fig. 3: *Diagrams of the tibia plateau*.

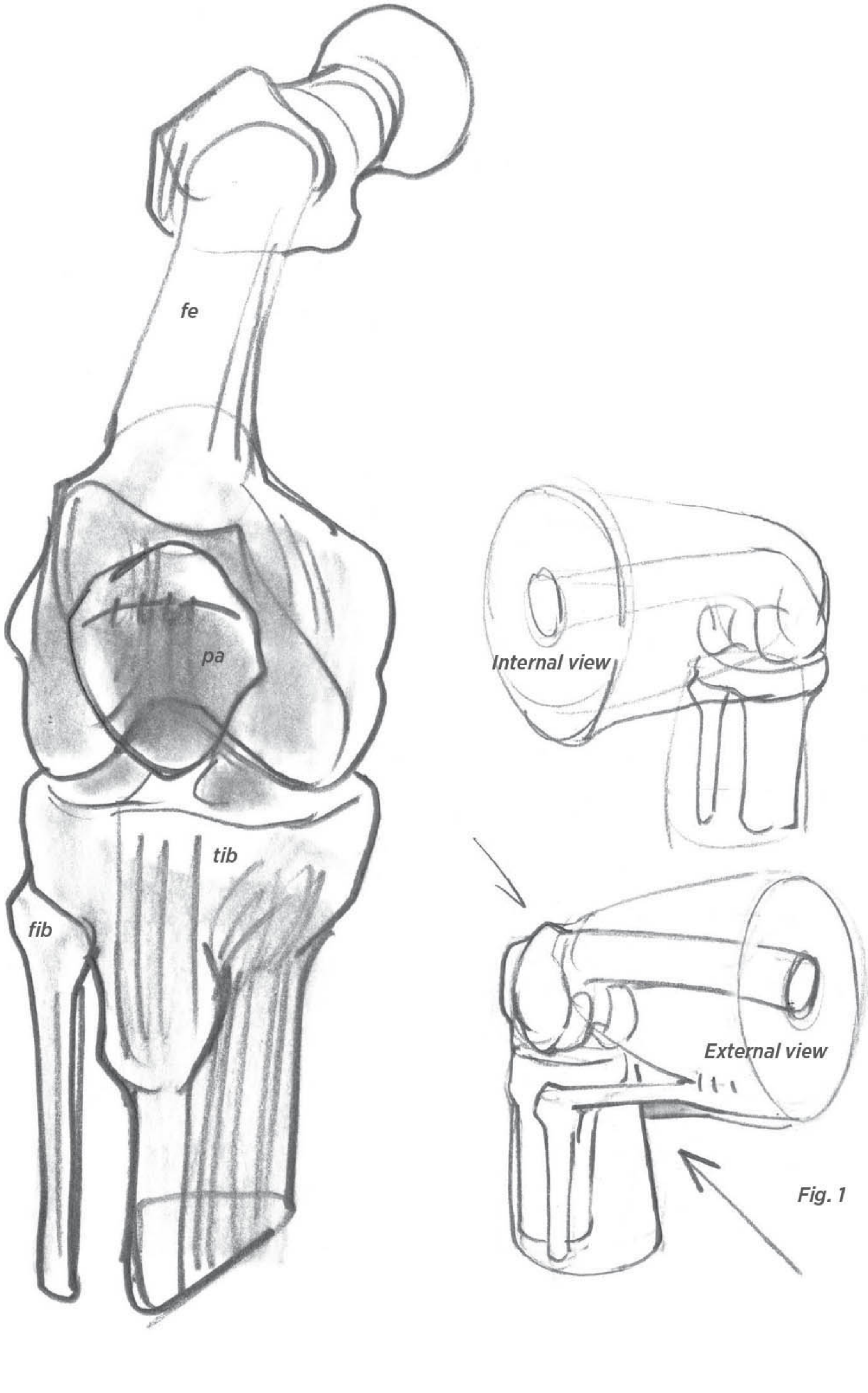


Fig. 1

Fig. 1: *The hamstrings are not inserted at exactly the same height on the leg. On the exterior, they insert onto the head of the fibula, and on the interior, they insert into the tibia plateau. This gap also holds true in flexion. In this position, the hollow of the shin, defined by the two lowered tendons of the hamstrings, opens out towards the exterior.*

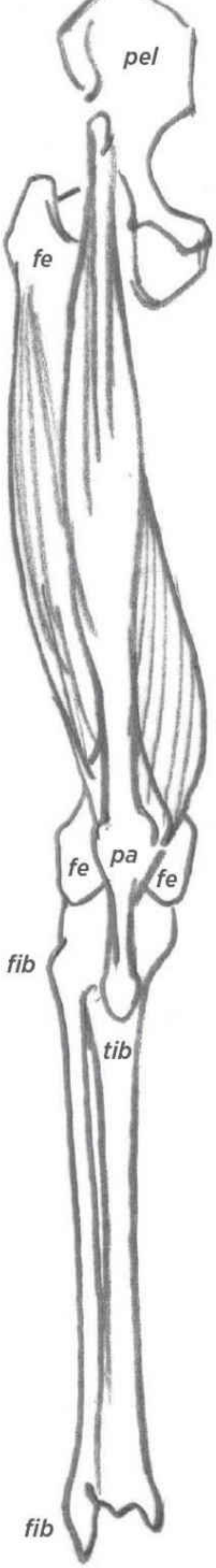
Fig. 2

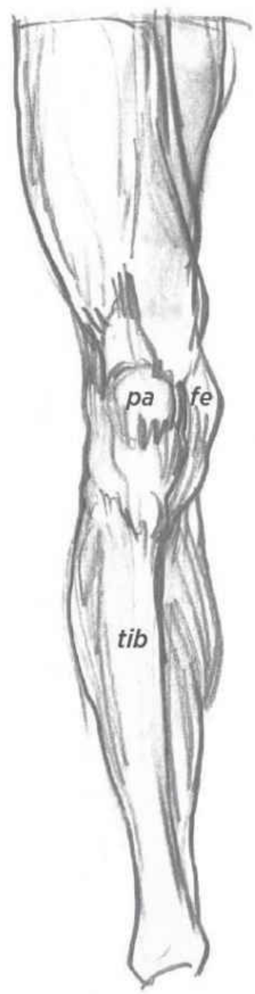
Fig. 3

Fig. 2: *The patella, connected to the tibia by the tendon of the quadriceps, is positioned above the knee joint, in front of the femur*.

Fig. 3: *In full flexion, with the thigh against the lower leg, the calf dominates the shape near the knee (with a curve and counter-curve) on the exterior, whereas the quadriceps and the sartorius together, sometimes along with the fat that is more common at this level, are what shape the interior*.


33
33
33
tib


pel
fe
fe
pa
fe
fib
tib
fib


pa
fe
tib

The quadriceps (33) consists of four muscular bundles, as its name indicates. They share an insertion on the tibia. However, only three of the bundles are depicted in this drawing; the fourth is too deep to be seen.

The patella (pa) is included in the tendon of the quadriceps.

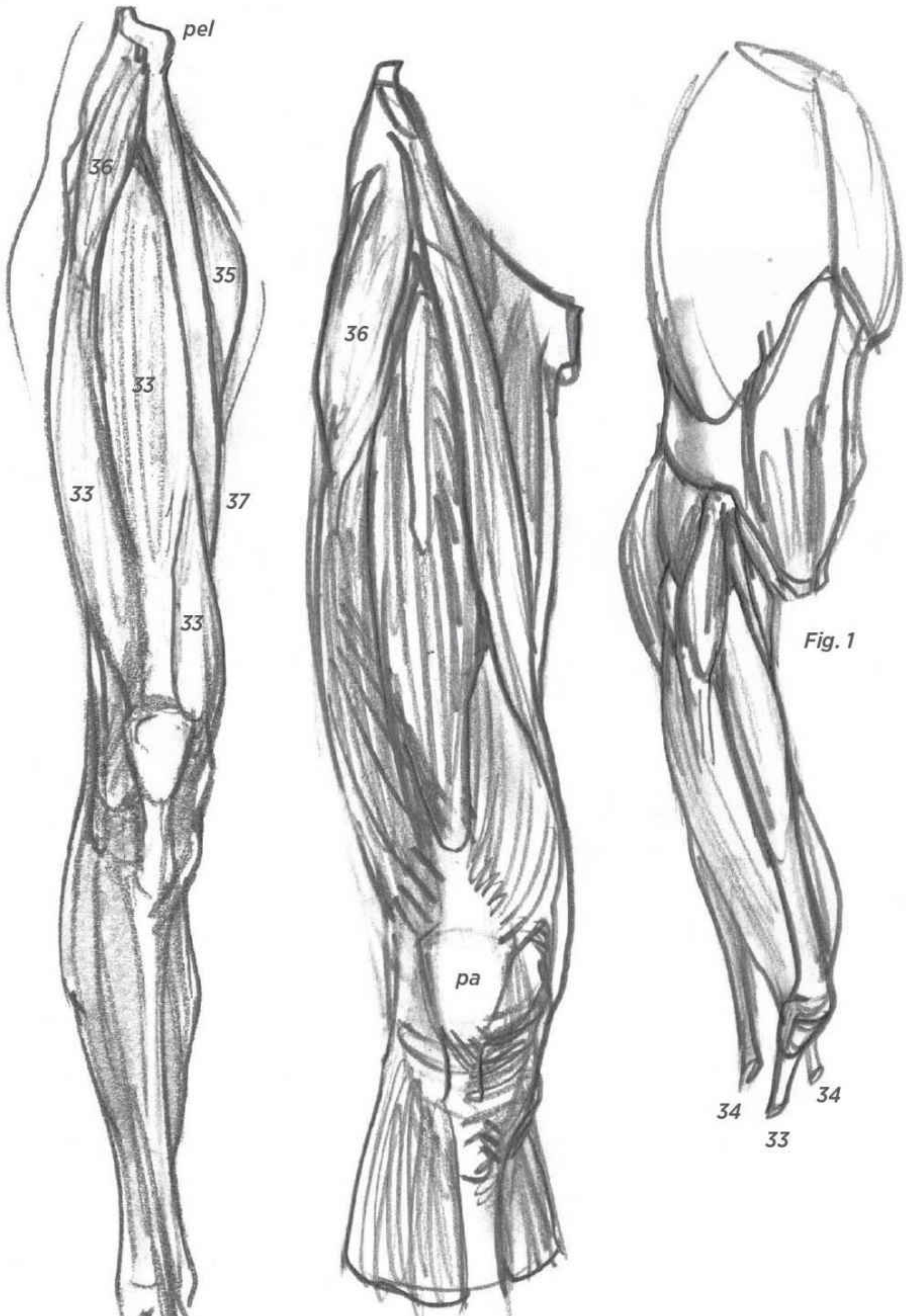
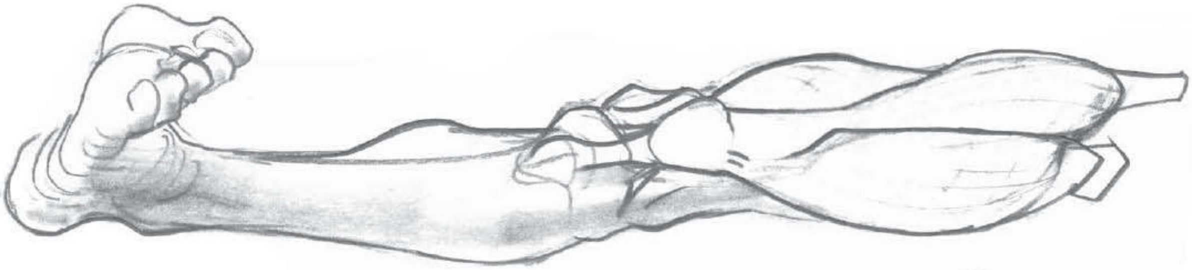
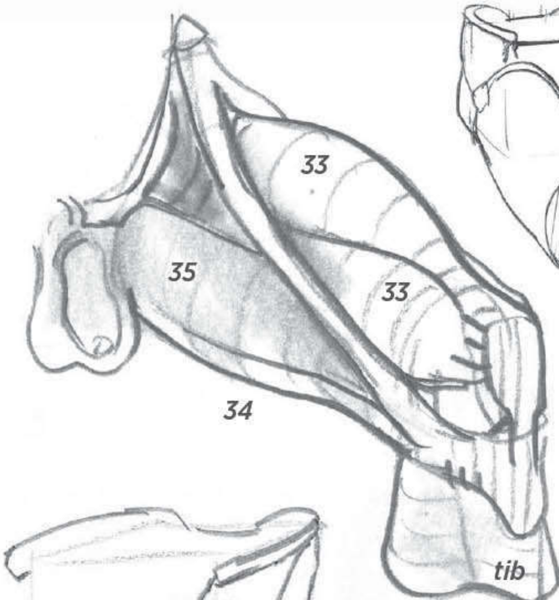
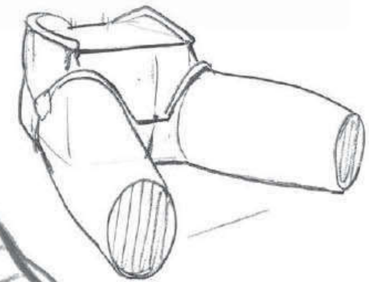


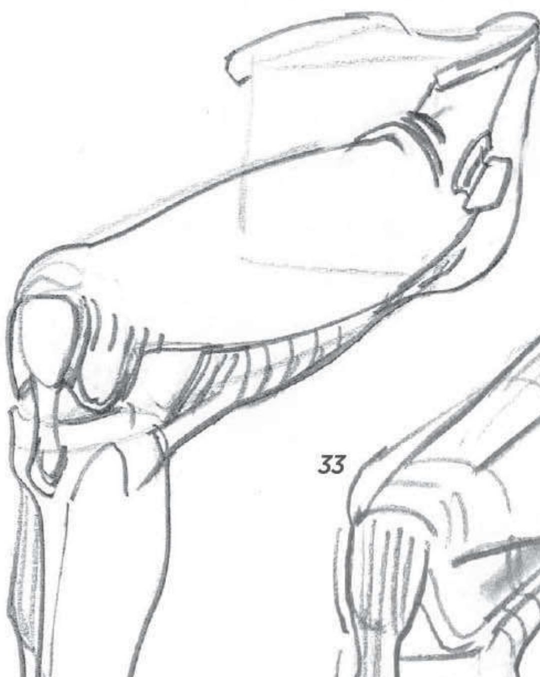
Fig. 1

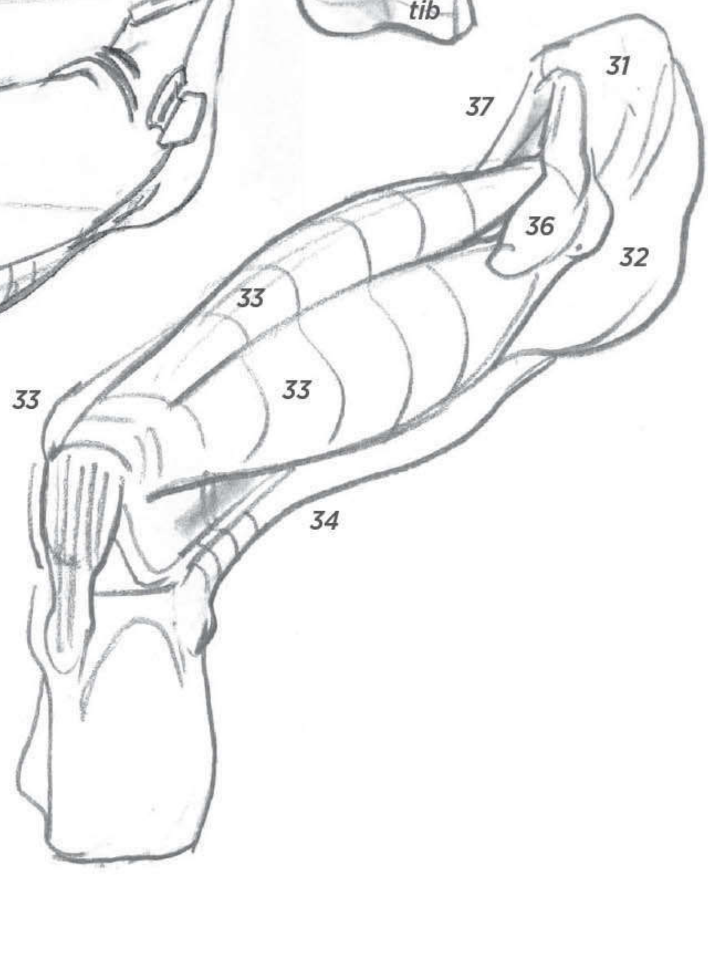
Fig. 1: *The tibia and fibula have been removed here, therefore, the tendons of the hamstrings (34) and quadriceps (33) are shown without attachments*.



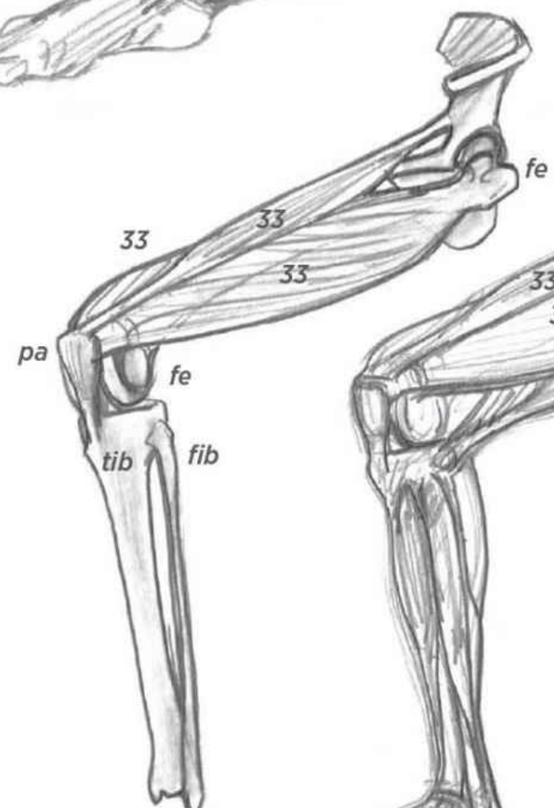

33
35
33
34
tib



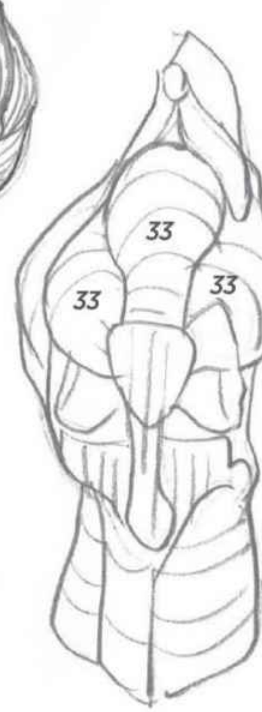


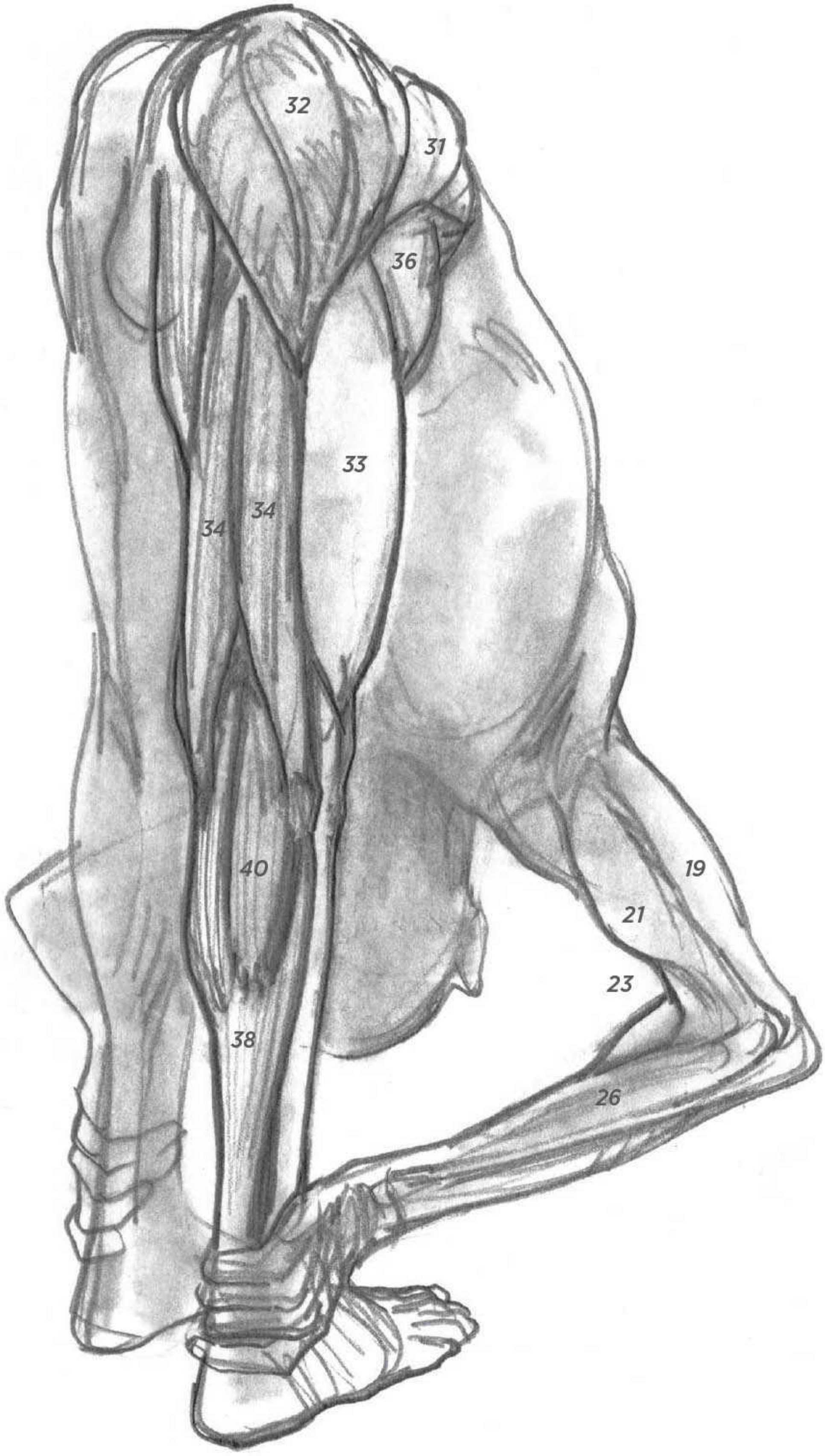

31
37
36
32
33
33
33
34

Quadriceps: *Be careful not to insert the quadriceps at the extremity of the wing of the pelvis, as you may be tempted to do. It needs to be positioned between that point and the hip joint. In a sitting position, the forward fold of the hip joint, which corresponds to the fold of a piece of clothing at the same level, coincides with the connection of the quadriceps to the pelvis.*

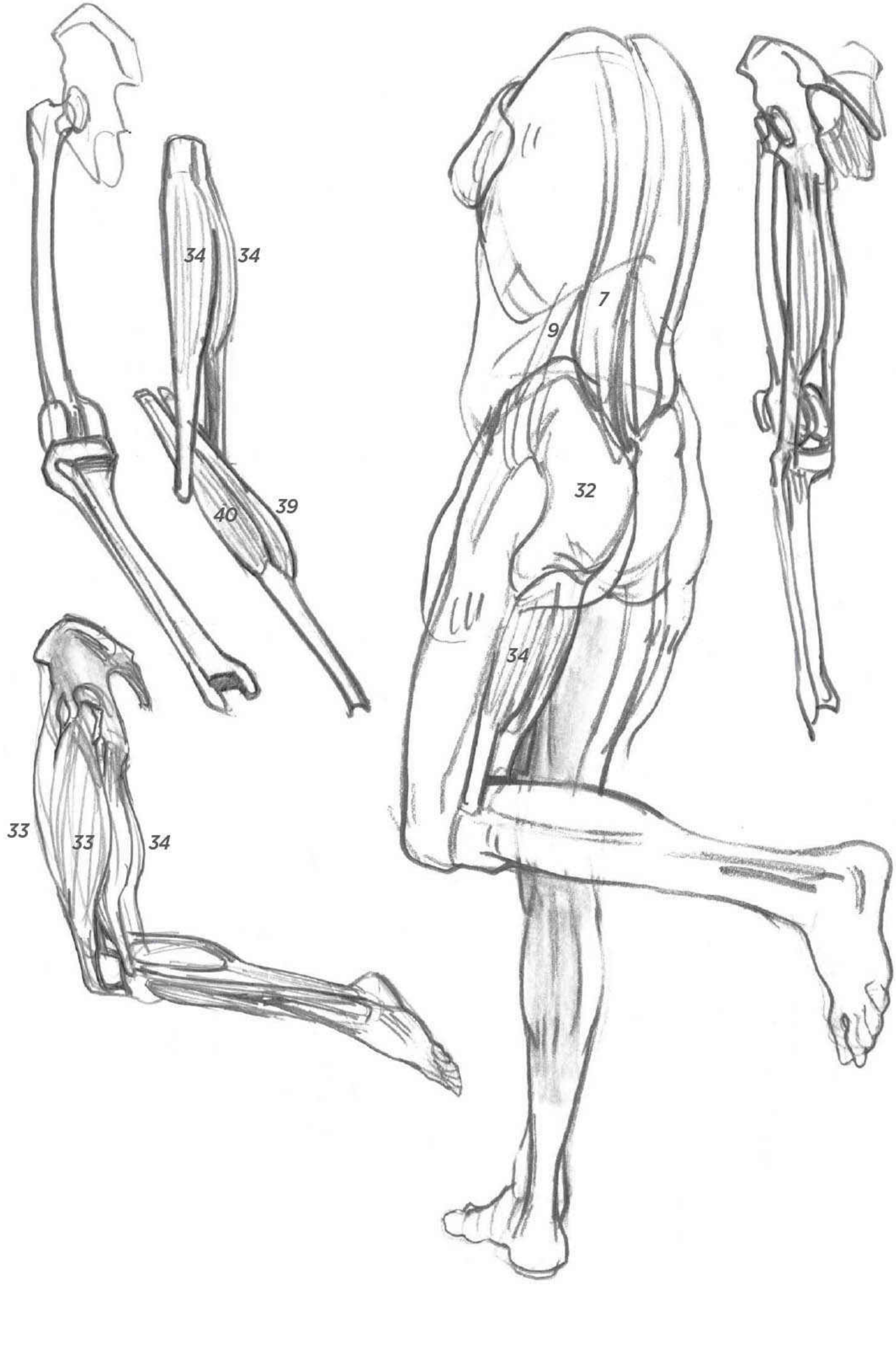

fe
33
33
33
pa
fe
tib
fib

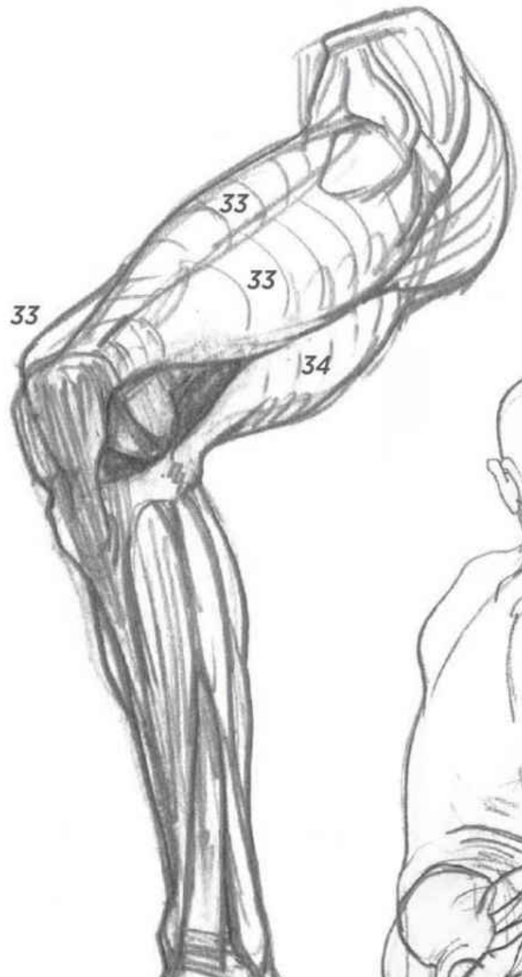

33
33

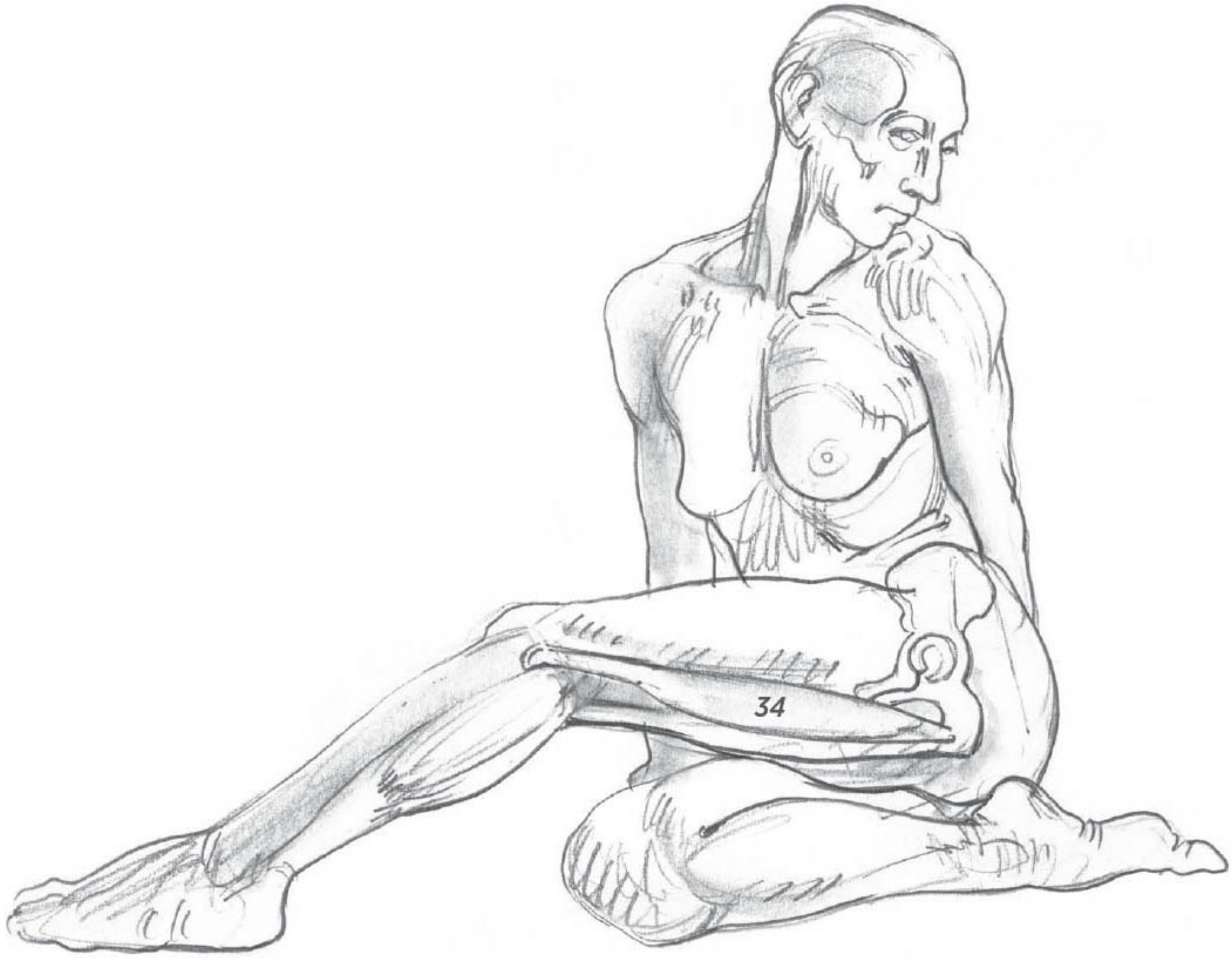

33
33
33



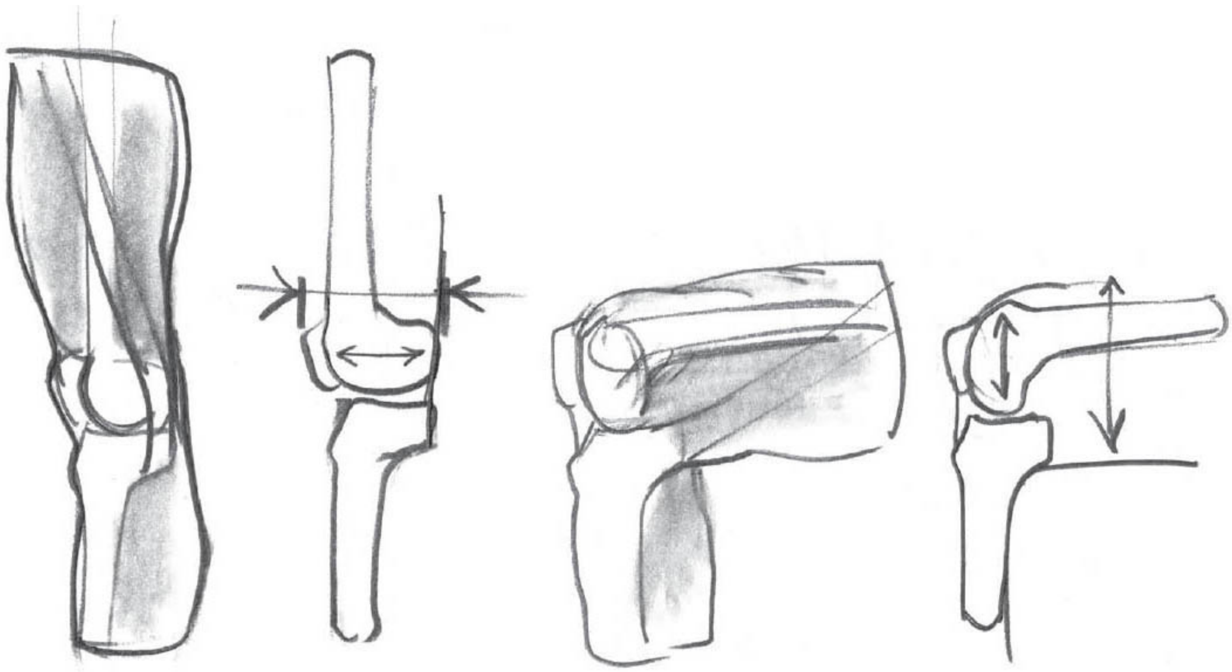
32
31
36
33
34
34
40
19
21
23
38
26


34
34
7
9
32
40
39
34
33
33
34


33
33
33
34



In flexion, the knee becomes wider as the two tendons of the hamstrings (34) are lowered, pulling the skin with them and creating two walls. In extension, the knee narrows as the tendons become vertical and flatten against the femur.



The width of the femur is reflected in the width of the knee in flexion.

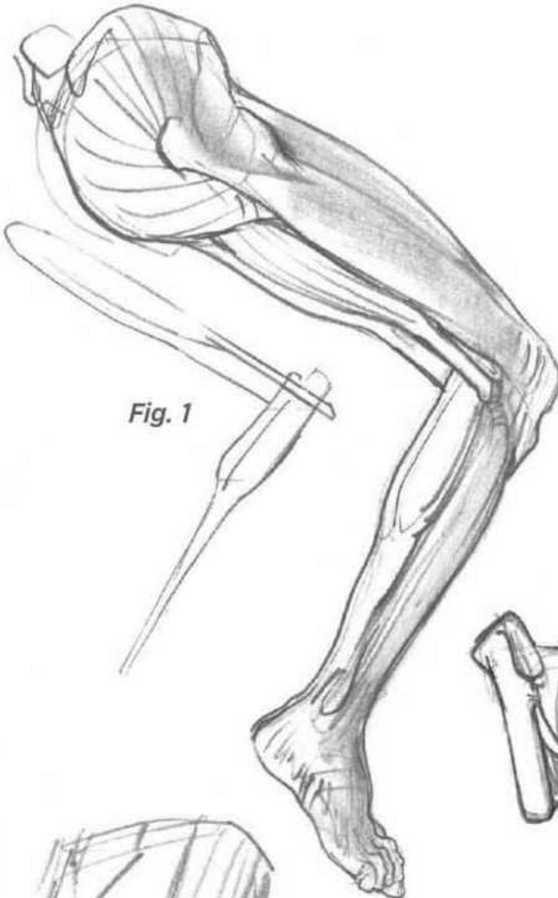


Fig. 1

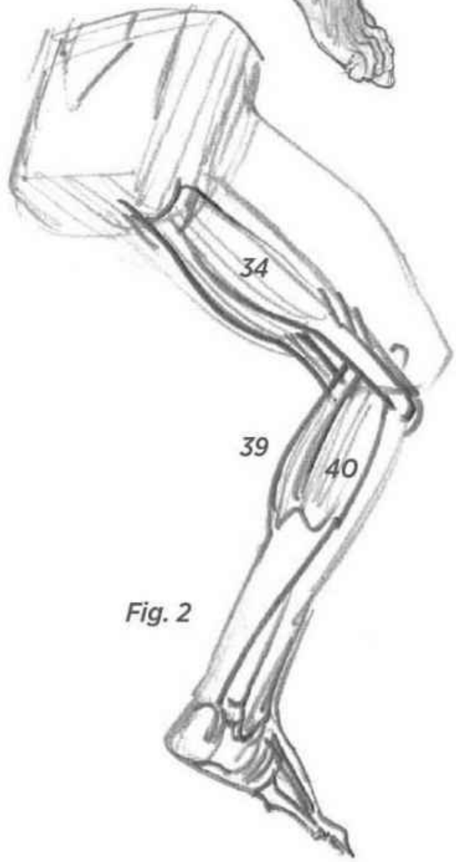


Fig. 2

Fig. 3

Fig. 1: *Connection between the hamstrings and the gemelli*.
Figs. 2 *and* ***3:*** *Combined version of the hamstrings (34)*.

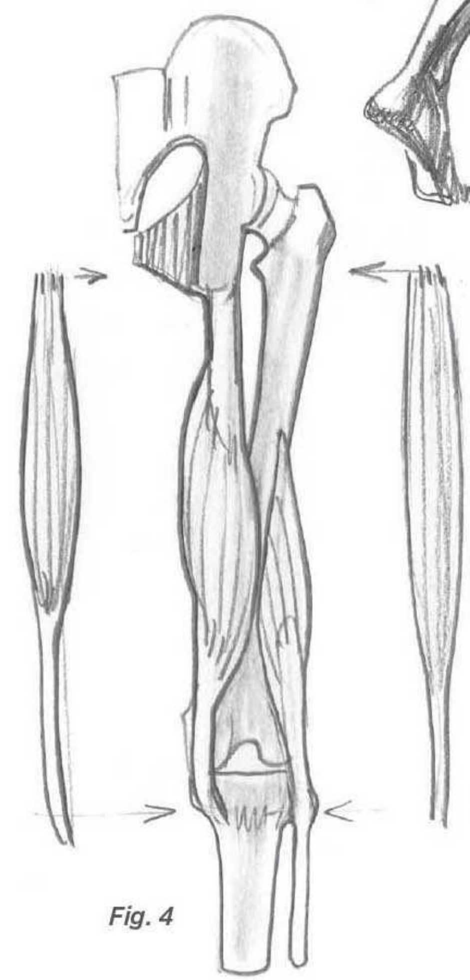


Fig. 4

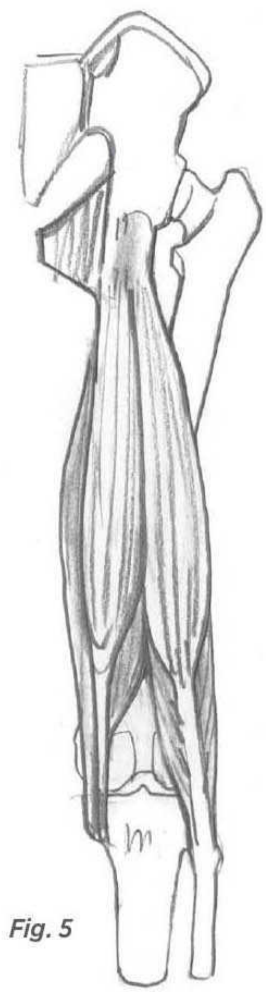


Fig. 5

Figs. 4 *and* ***5:*** *Exploded view of the hamstrings. Two muscle layers shown superimposed.*

Fig. 1

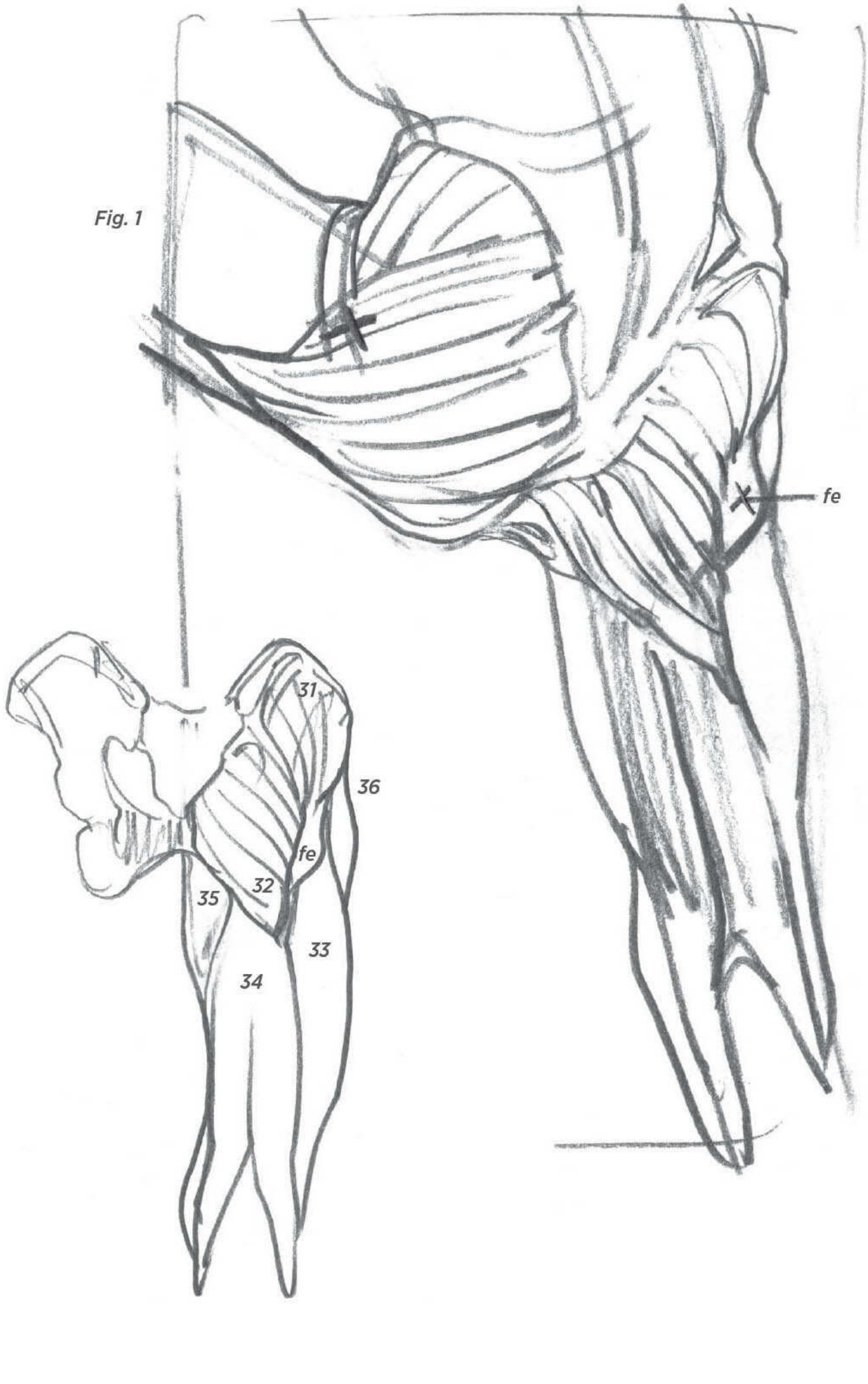


Fig. 1: *The tip of the femur, or trochanter (fe), is exposed when the limb is in extension, and is covered by the gluteus maximus when in pronounced flexion.*

Fig. 2

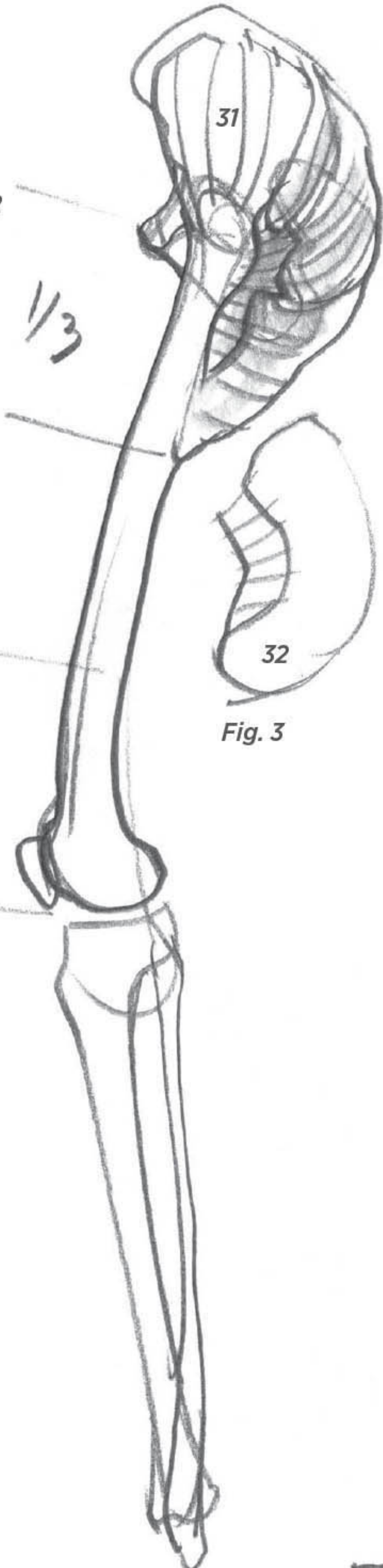
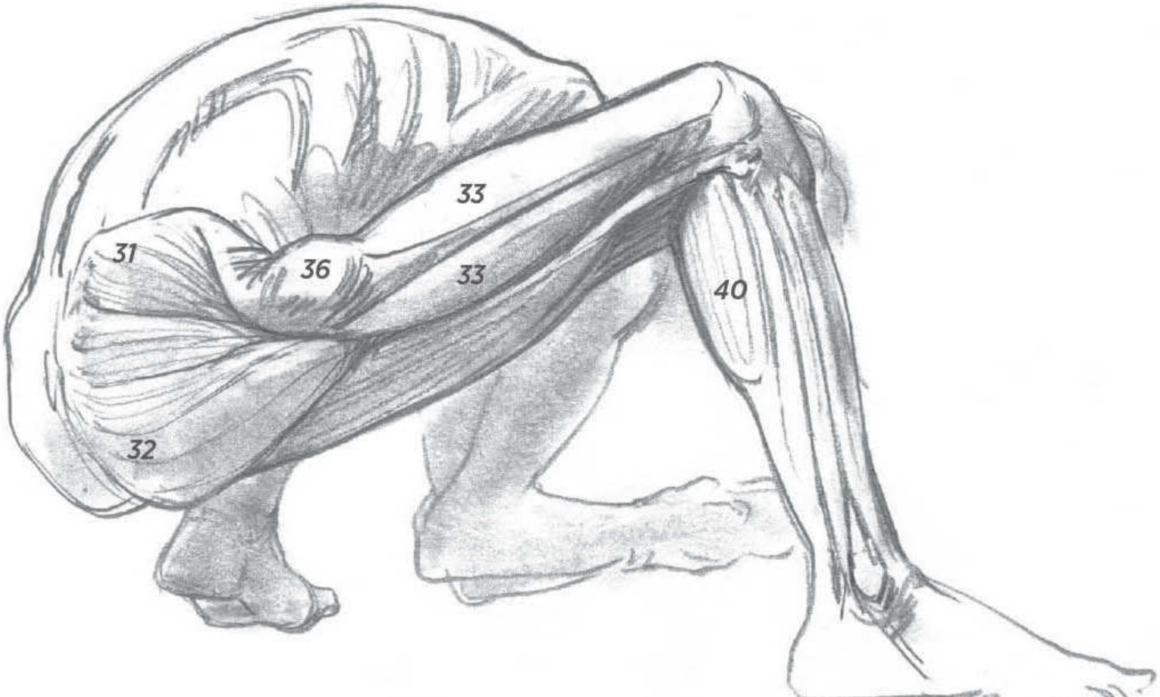


Fig. 3

Fig. 2: *The gluteus maximus (32) is inserted on a third of the femur*.
Fig. 3: *The fleshy fibers are distinguished from the tendinous fibers, and they are kidney shaped behind the hip joint*.

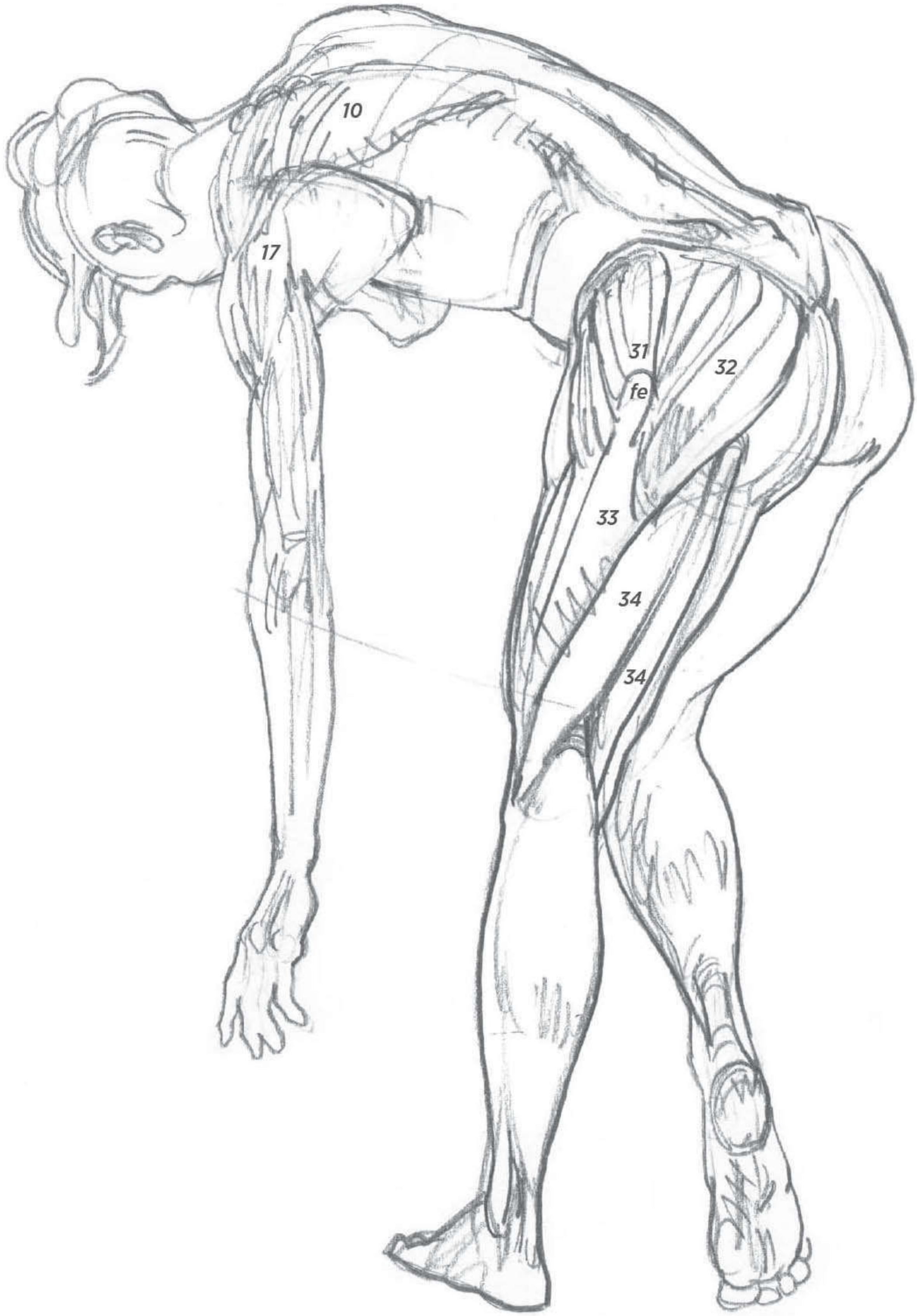

33
31
36
33
40
32

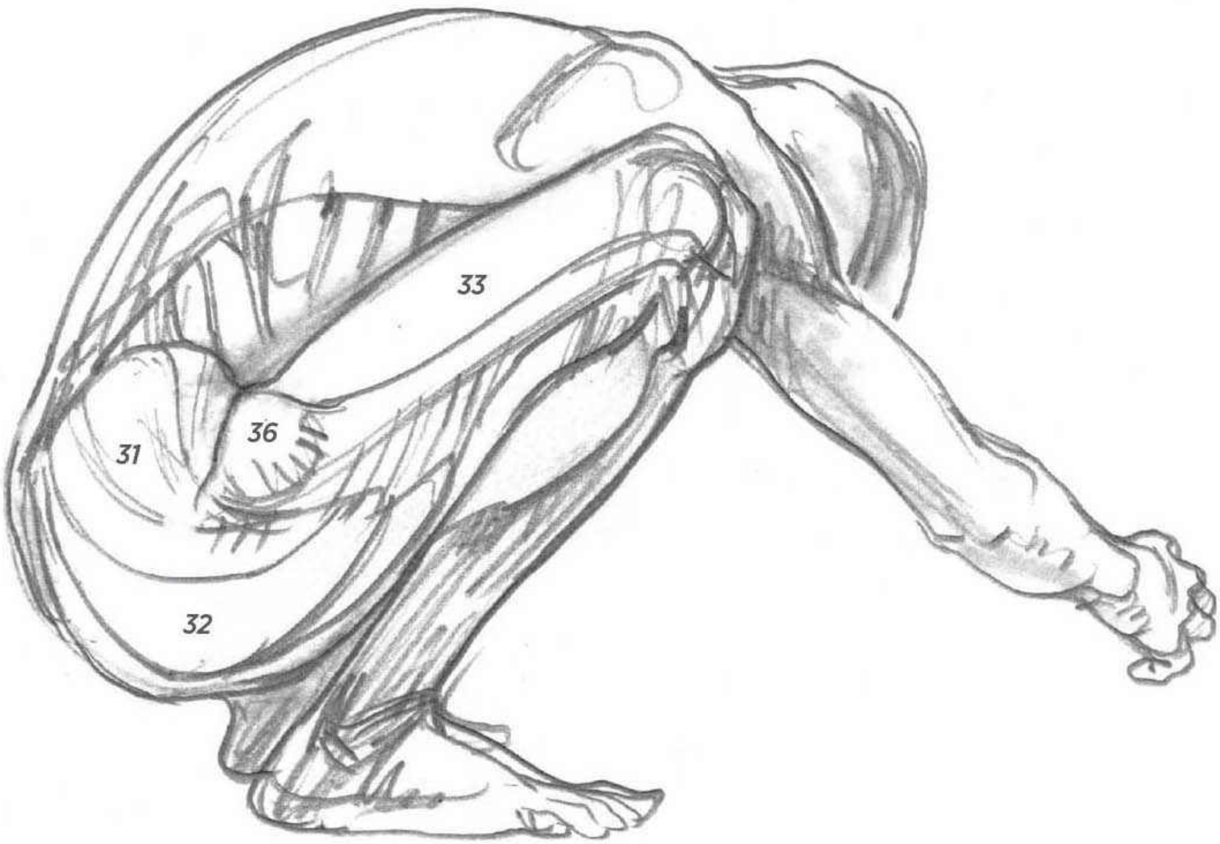
The gluteal muscle slides over the tip of the femur (or trochanter) in flexion and covers it with the complete flexion of the thigh against the torso.

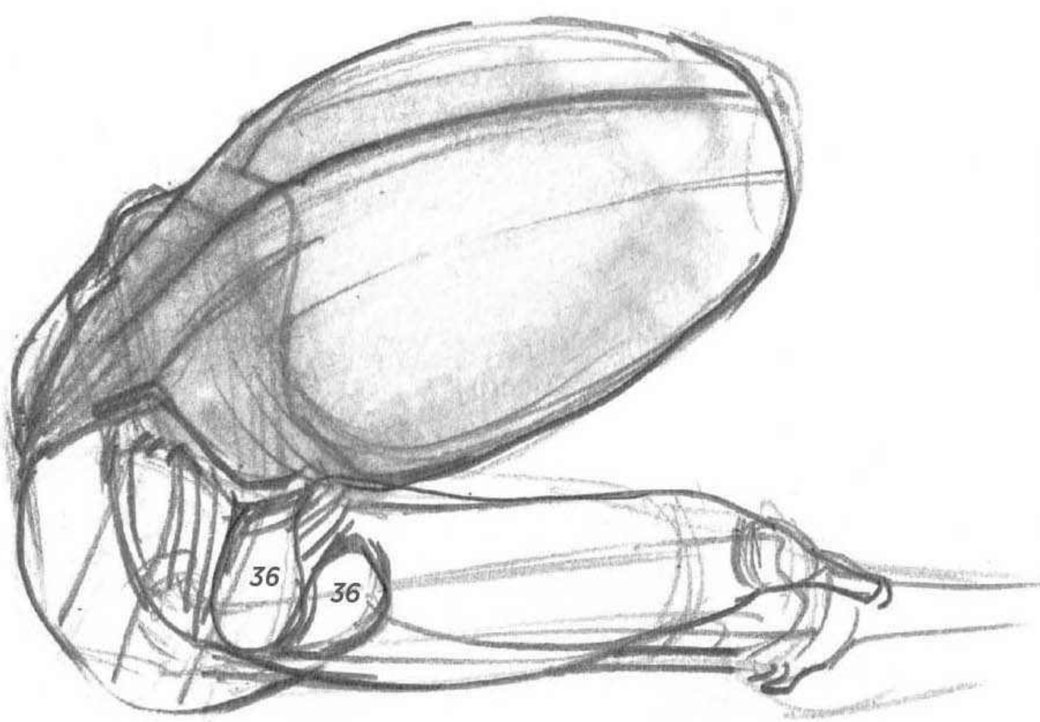

10
32


15
9
31
36
33
33
32

The deep muscle bundles—the most powerful of the gluteus maximus—insert directly into the femur by sliding between the hamstrings (34) and the quadriceps (33).

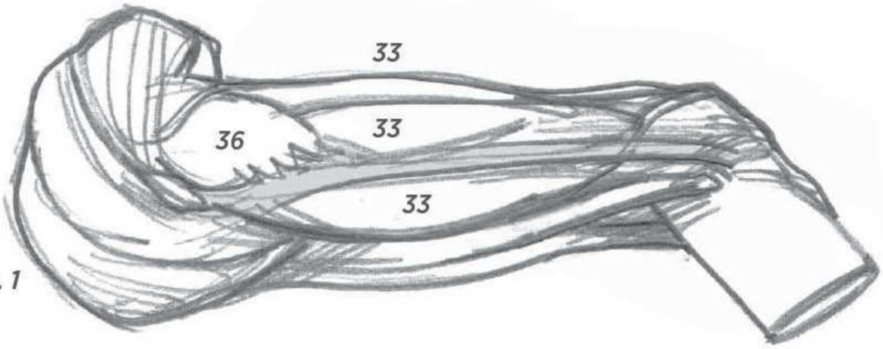

10
17
31
fe
32
33
34
34


33
36
31
32


36
36

In full flexion of the thigh against the torso, the tensor muscle of the fascia lata (36) is restricted at the flexion fold of the hip joint.

Fig. 1



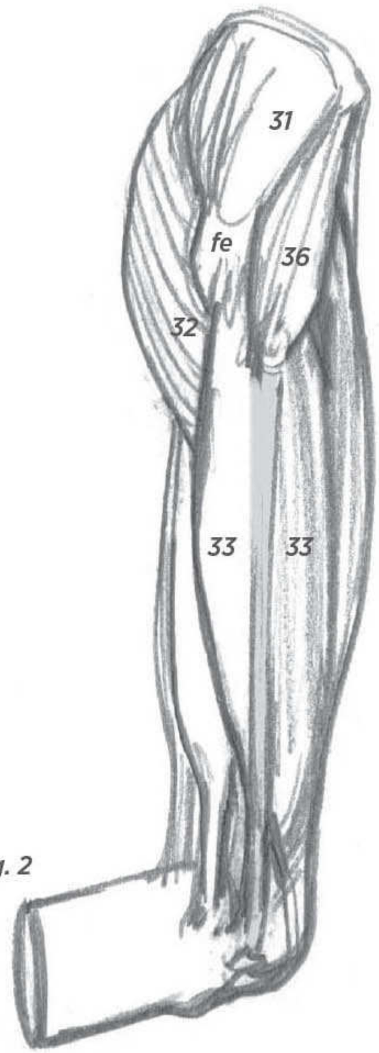


Fig. 2

The fascia lata (shaded) does not have any clearly defined limits. It is an arbitrary slice of the superficial membrane of the thigh, like a ribbon pattern on a stocking that envelops the entire lower limb. Some of the fibers of the gluteus maximus (32) attach to it, as does the tensor of the fascia lata (36). This slice can be made in multiple ways (Figs. 1 and 2). Because it is rarely visible, I will often choose not to show the fascia lata at all. When the tensor exerts its action, the membrane tenses all the way to the tibia, and then one can see, on the external side of the knee, a sinewy strip that corresponds to it.

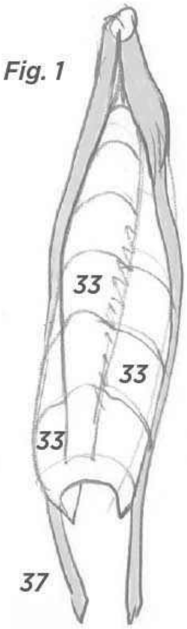
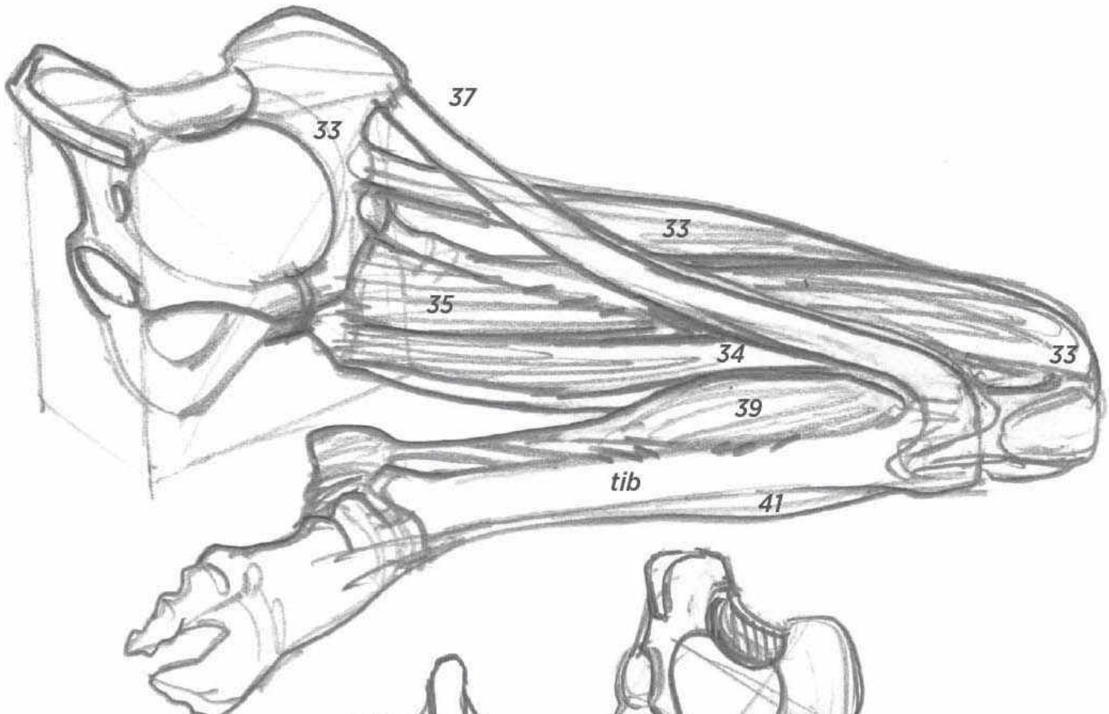


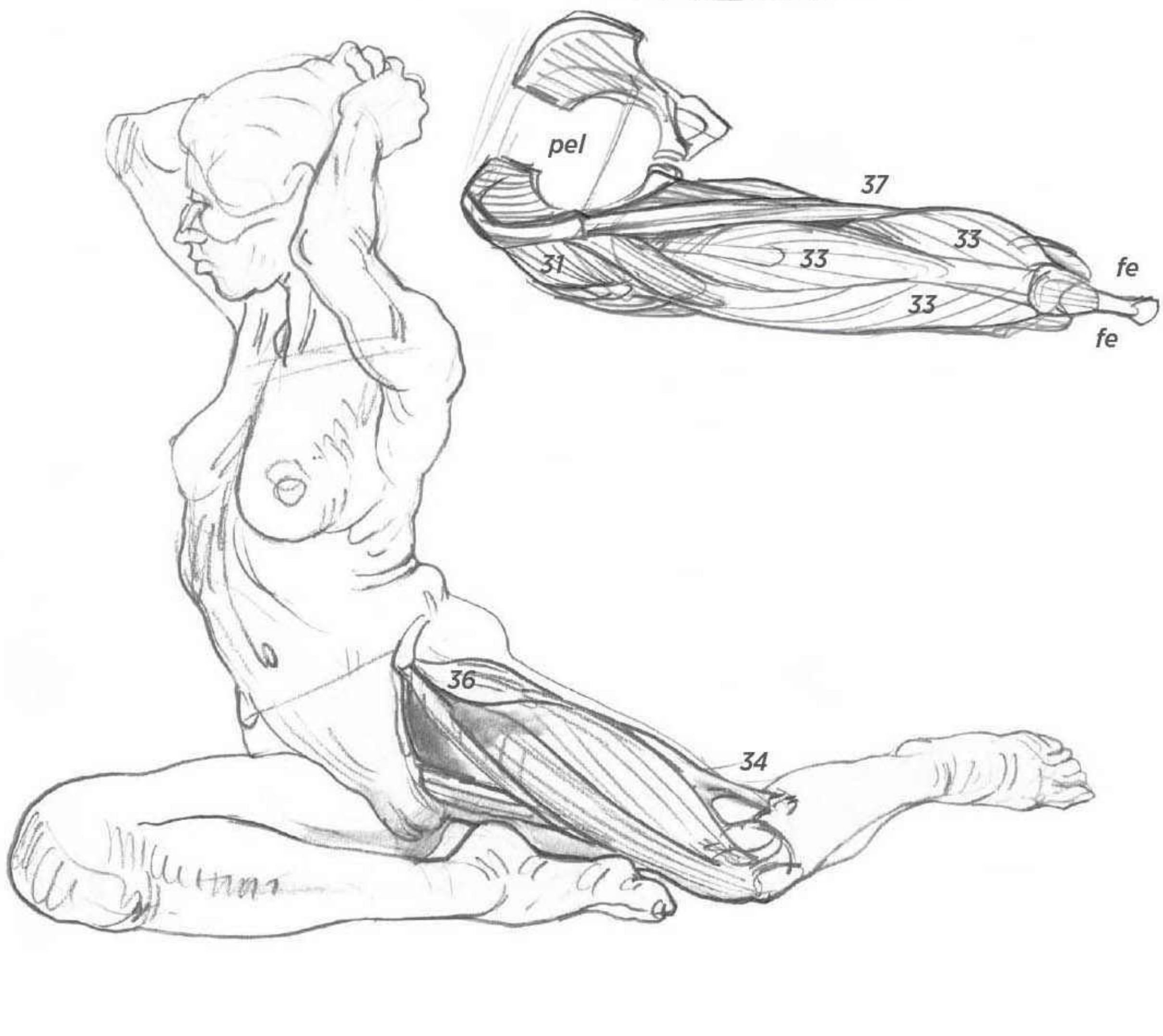
Fig. 1

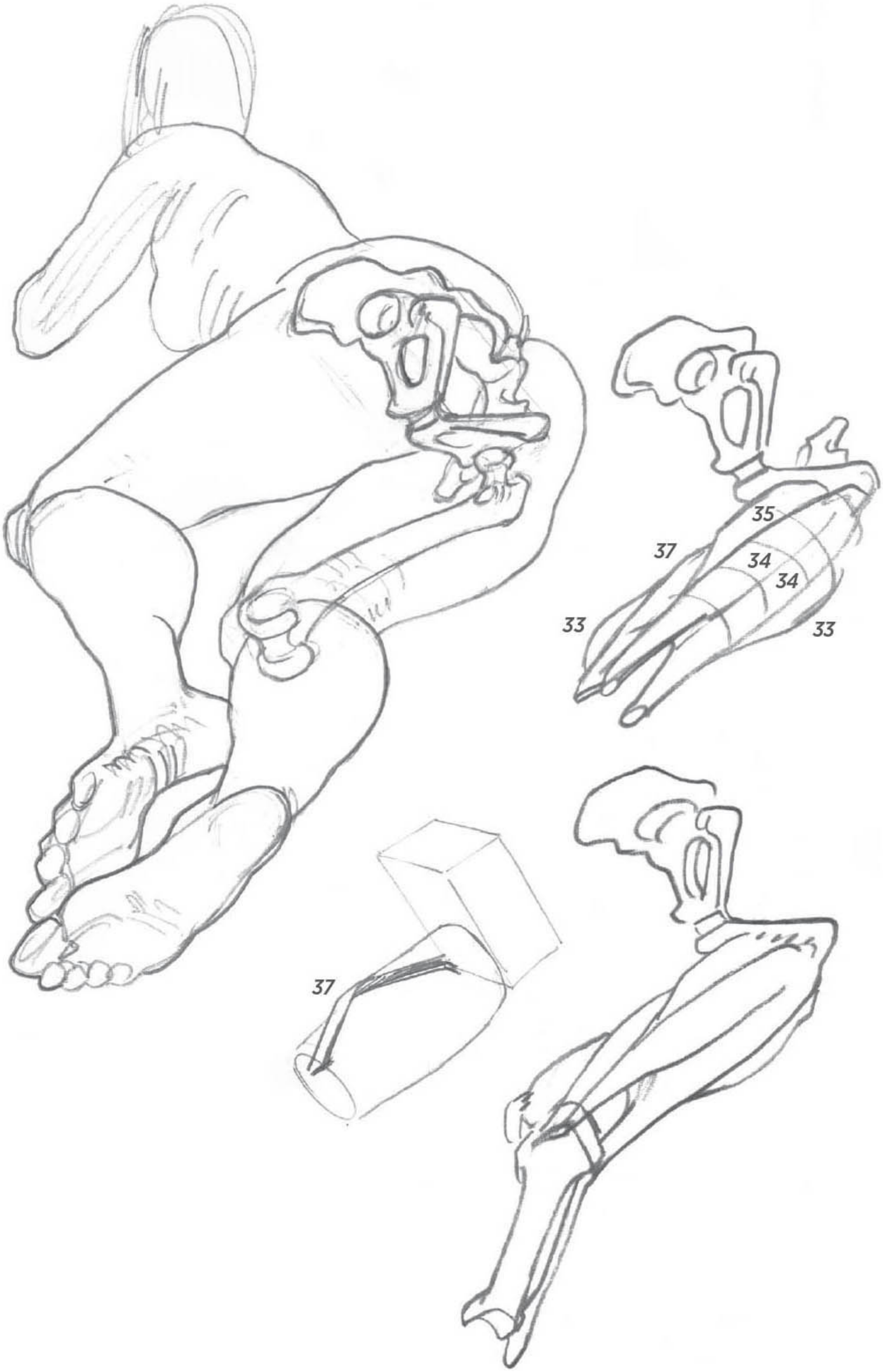
Fig. 1: *The tensor muscles of the fascia lata (36) and the sartorius (37) are both inserted at the crest of the pelvis. They slide along the sides of the quadriceps (33) and they meet up at the same level on the tibia, on either side of the joint, which they seem to support*.

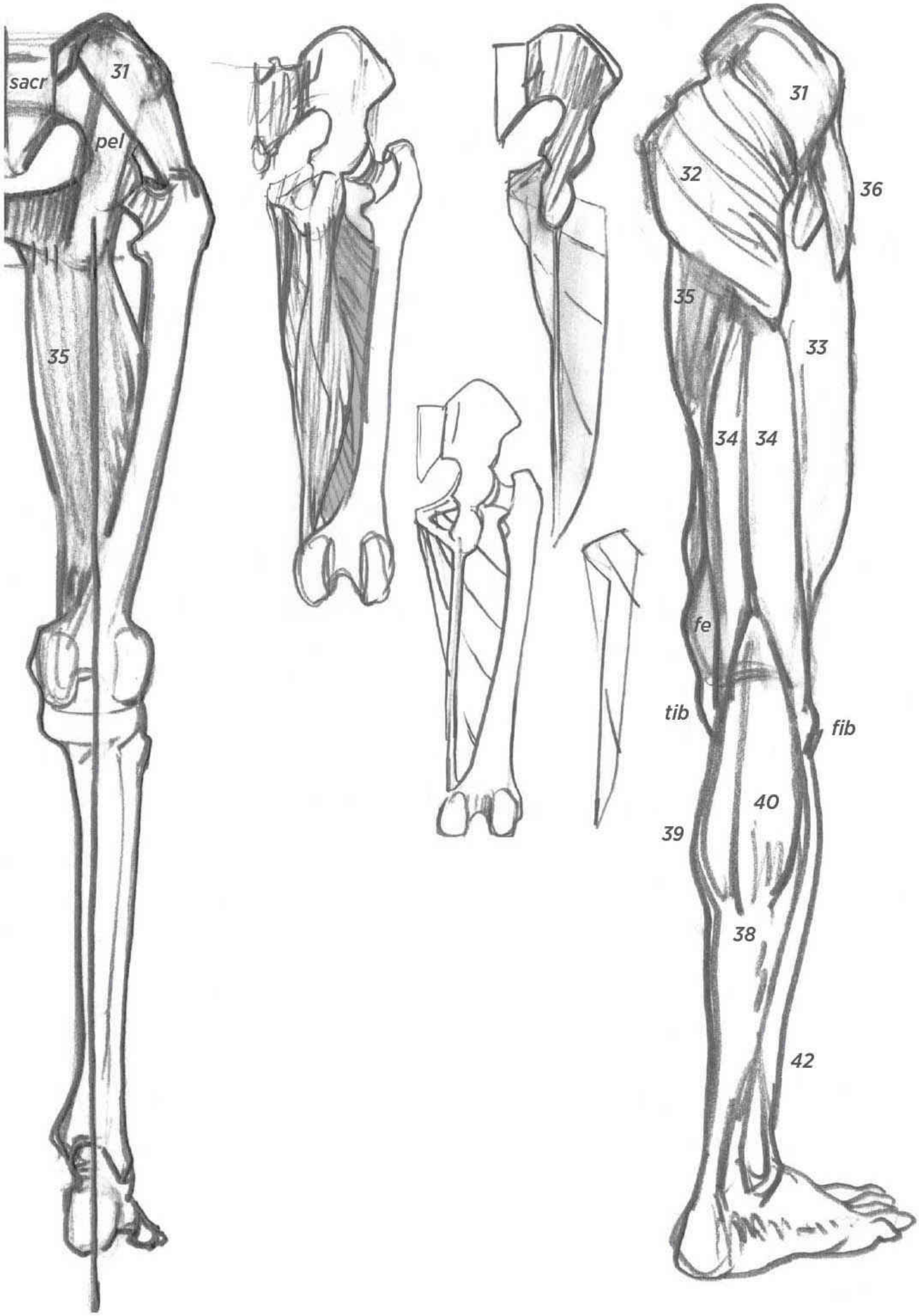


37
33
33
35
34
33
39
tib
41

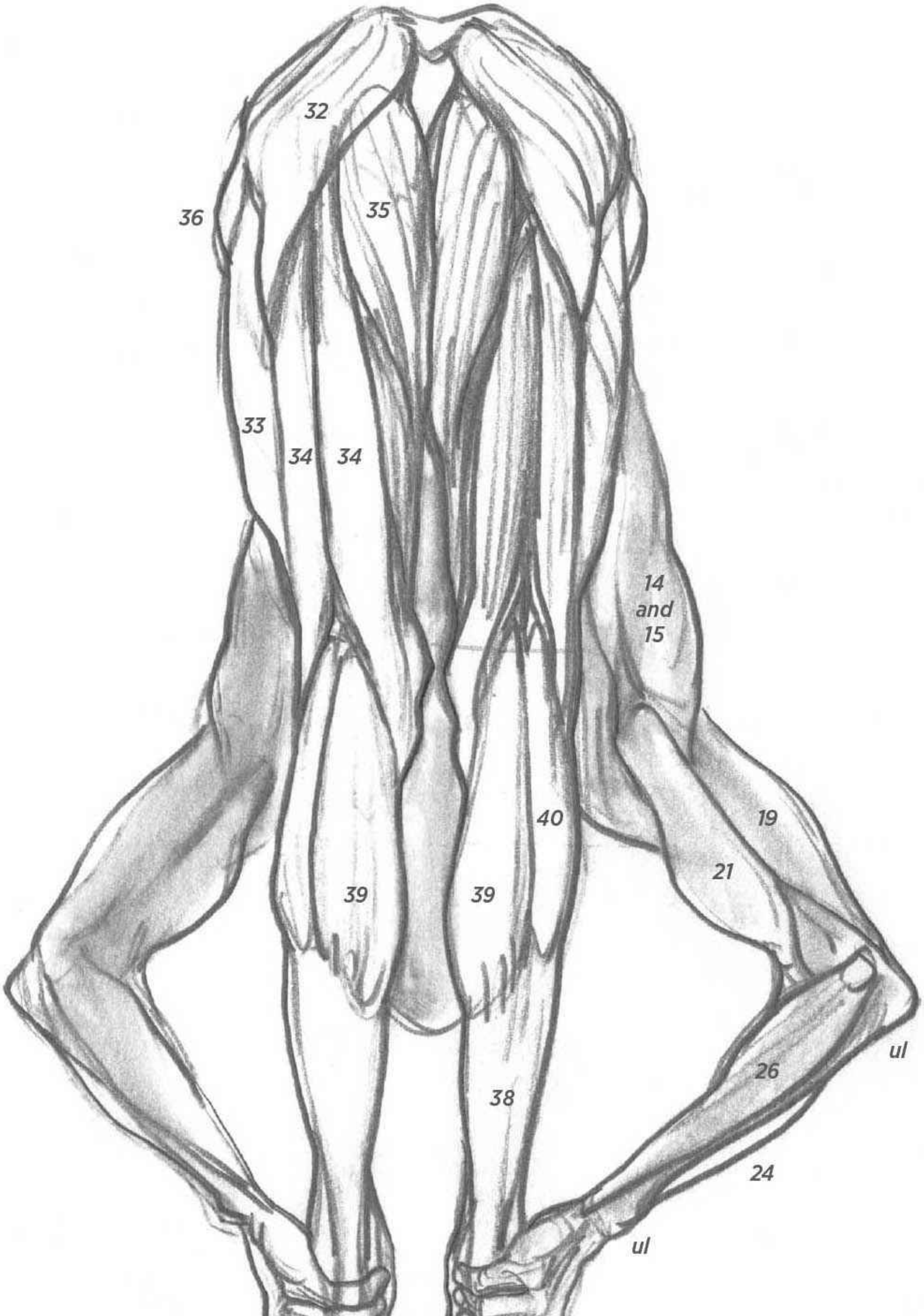
Connection between the sartorius (37) and the tibia (tib).

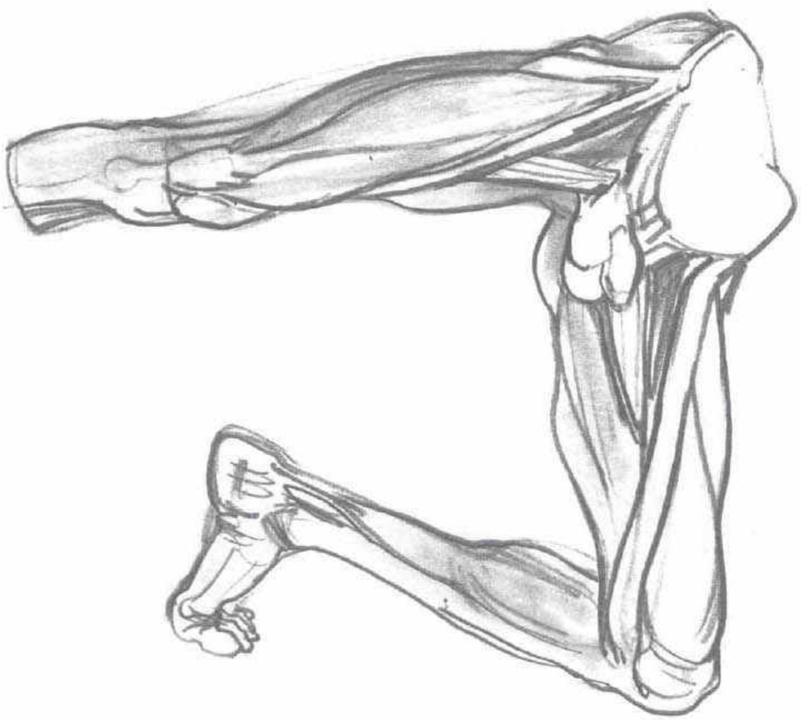

pel
37
33
33
31
33
fe
fe
36
34


35
37
34
34
33
33
37


sacr
31
pel
35
31
32
36
35
33
34
34
fe
tib
fib
40
39
38
42

Adductors: *The set of bundles that looks like one large fleshy mass on the inside of the thigh (35).*


32
36
35
33
34
34
14
and
15
40
19
21
39
39
ul
26
38
24
ul




35
34
33
33

The superficial gracilis muscle is rarely distinguished from the rest of the adductors. The fat in that area simplifies the drawing even further.

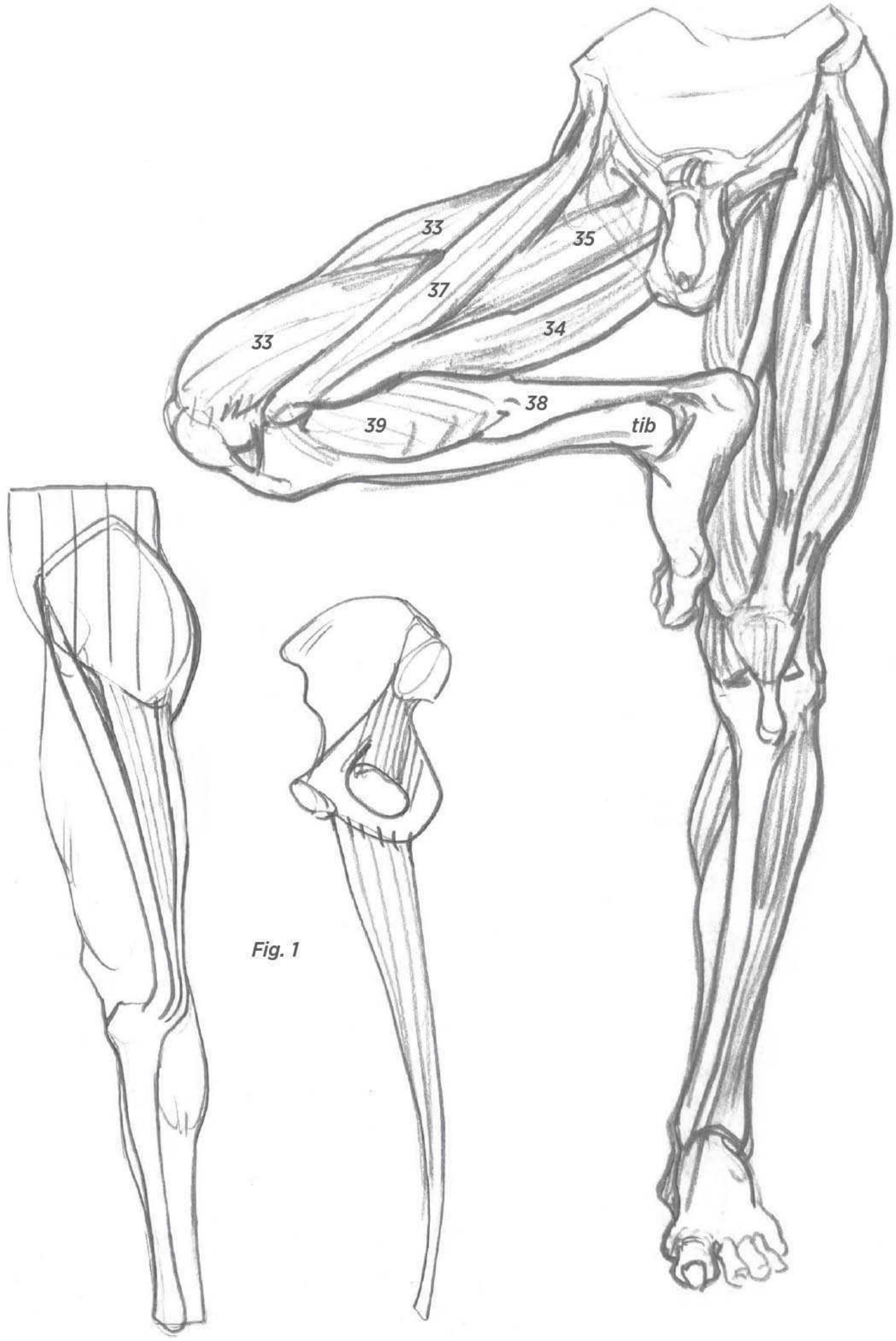
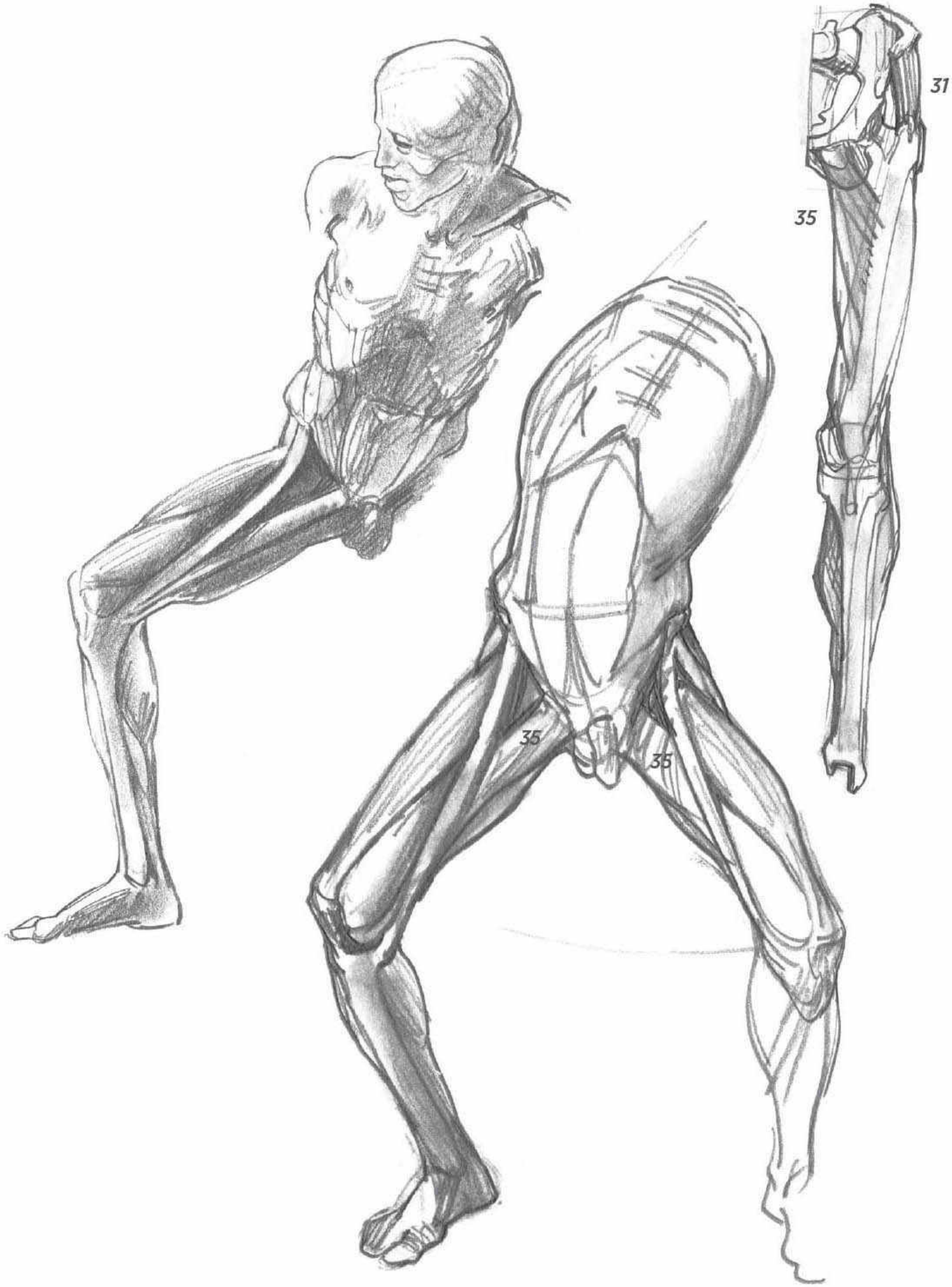
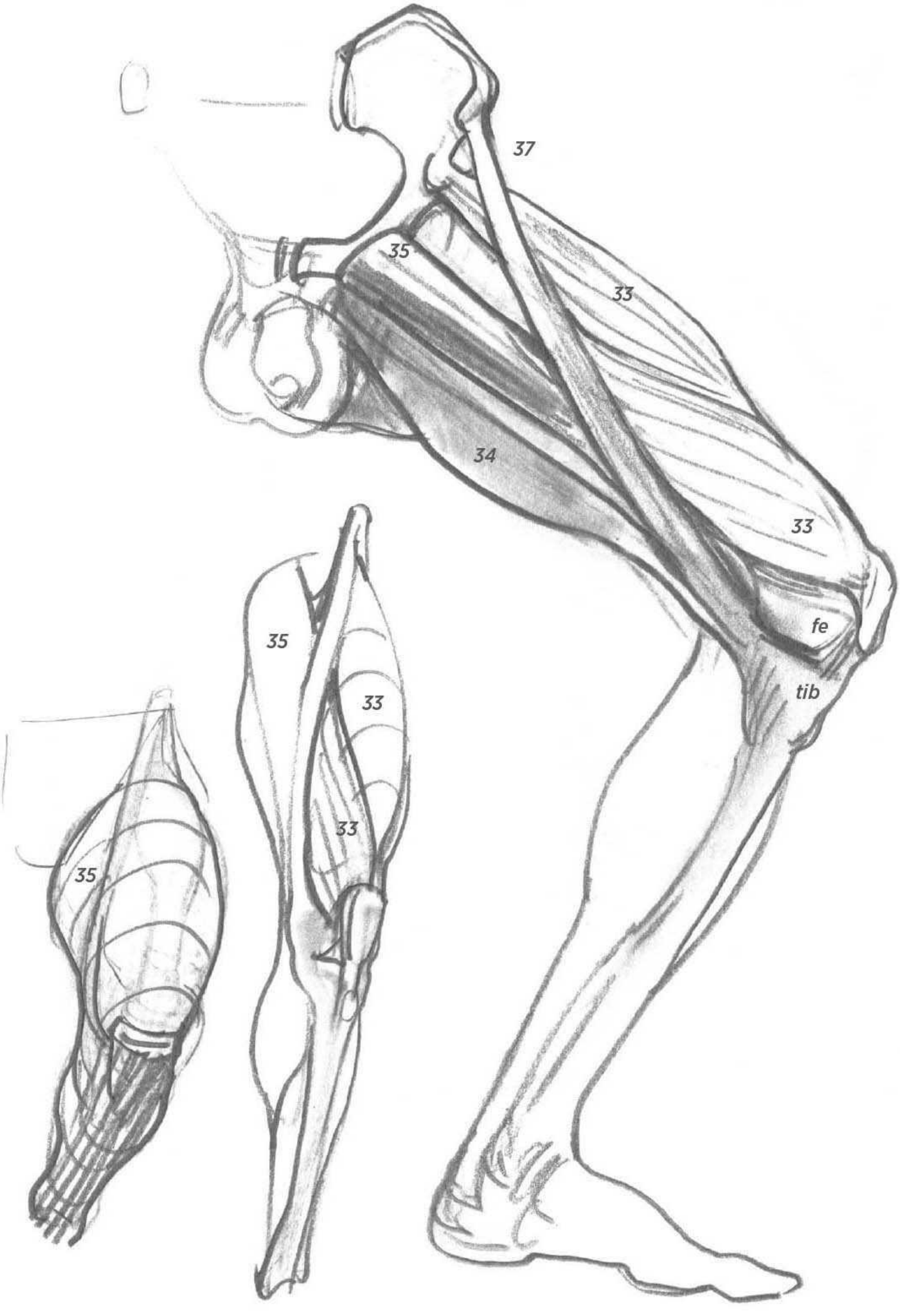


Fig. 1

Fig. 1: *Internal views. The adductors are basically inserted into the femur. Only the most superficial of them, the gracilis muscle, shown here in isolation, attaches to the tibia. At this level, it joins one of the hamstrings and the sartorius*.


31
35
35
35


37
35
33
34
33
fe
tib
35
33
33
35

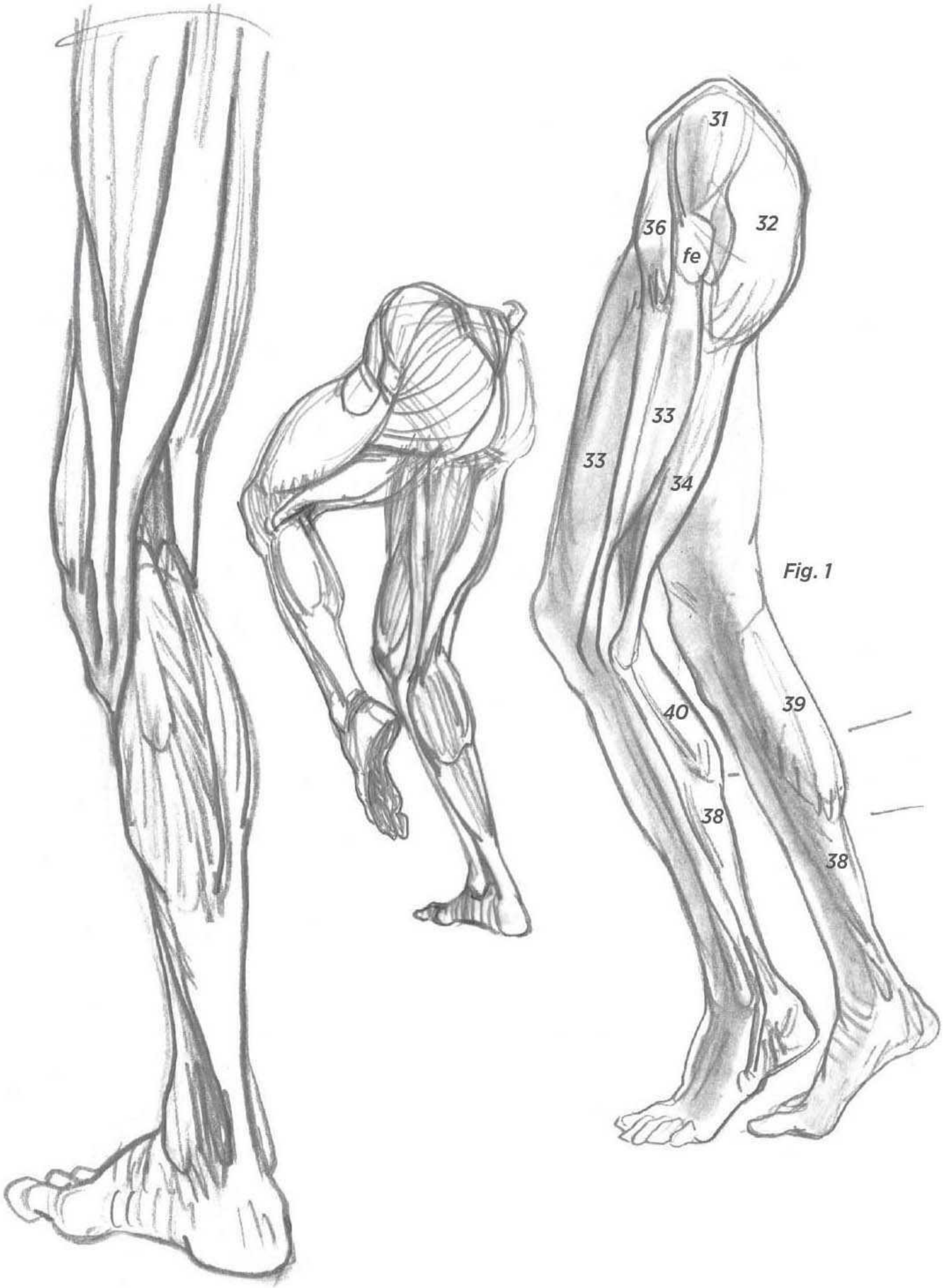


Fig. 1

Fig. 1: *The soleus (38) and the gemelli (39 and 40), which covers it, share an insertion in the foot (Achilles tendon) and thus form a triceps. The gemelli are not entirely identical: the inferior gemellus is more voluminous and descends further down on the tendon.*

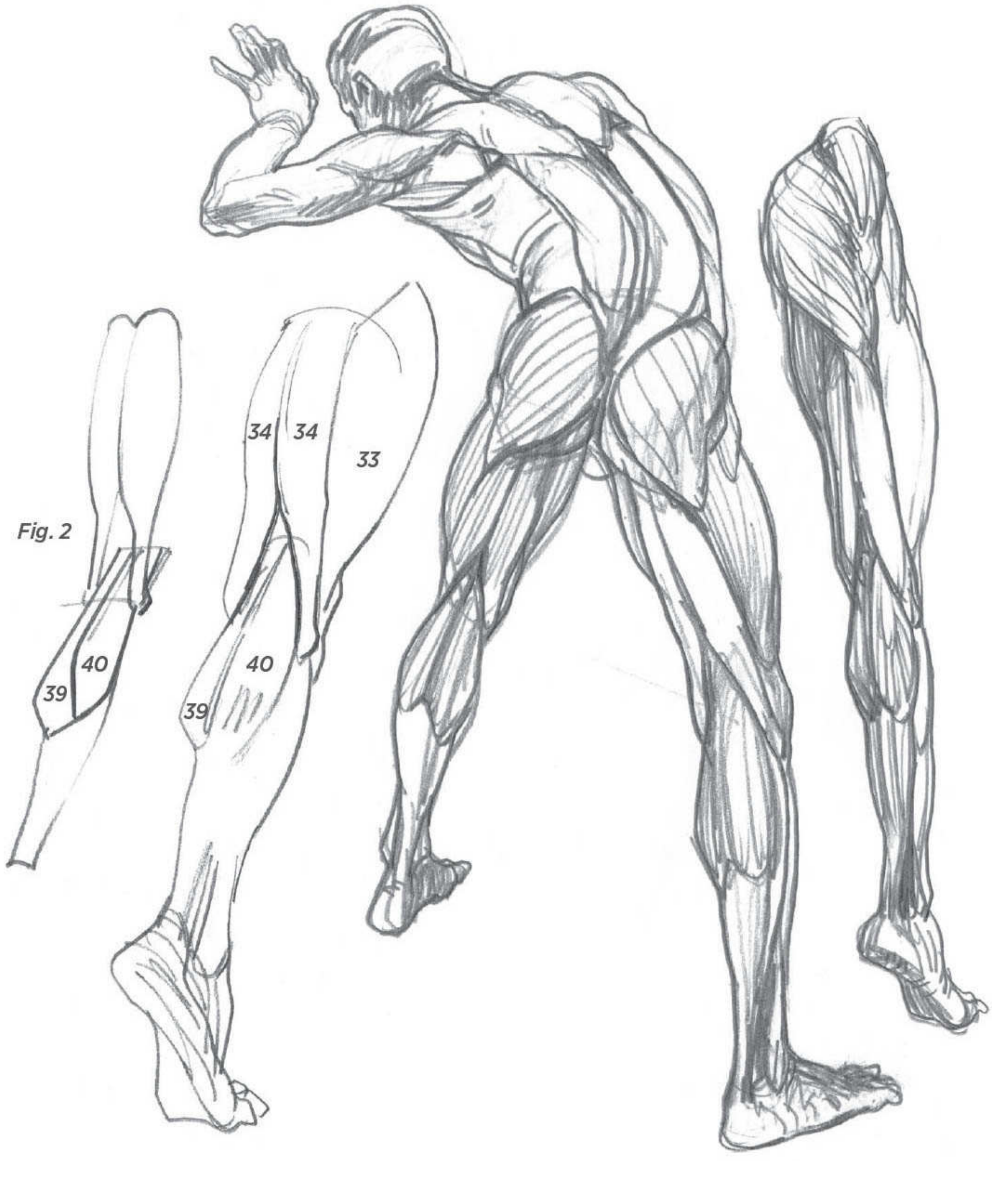
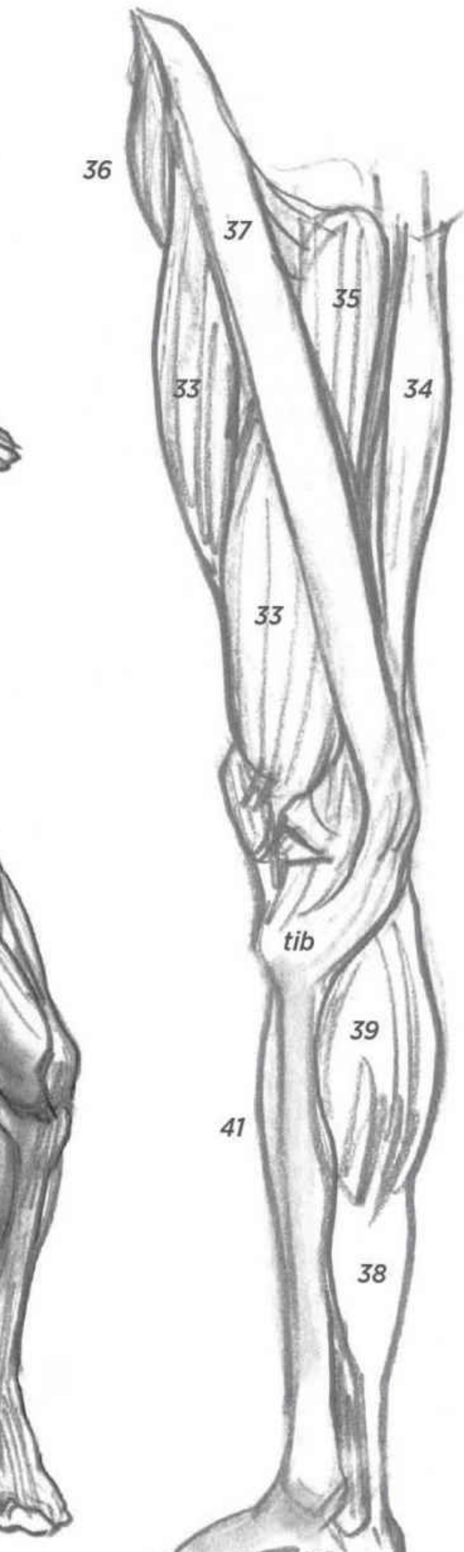
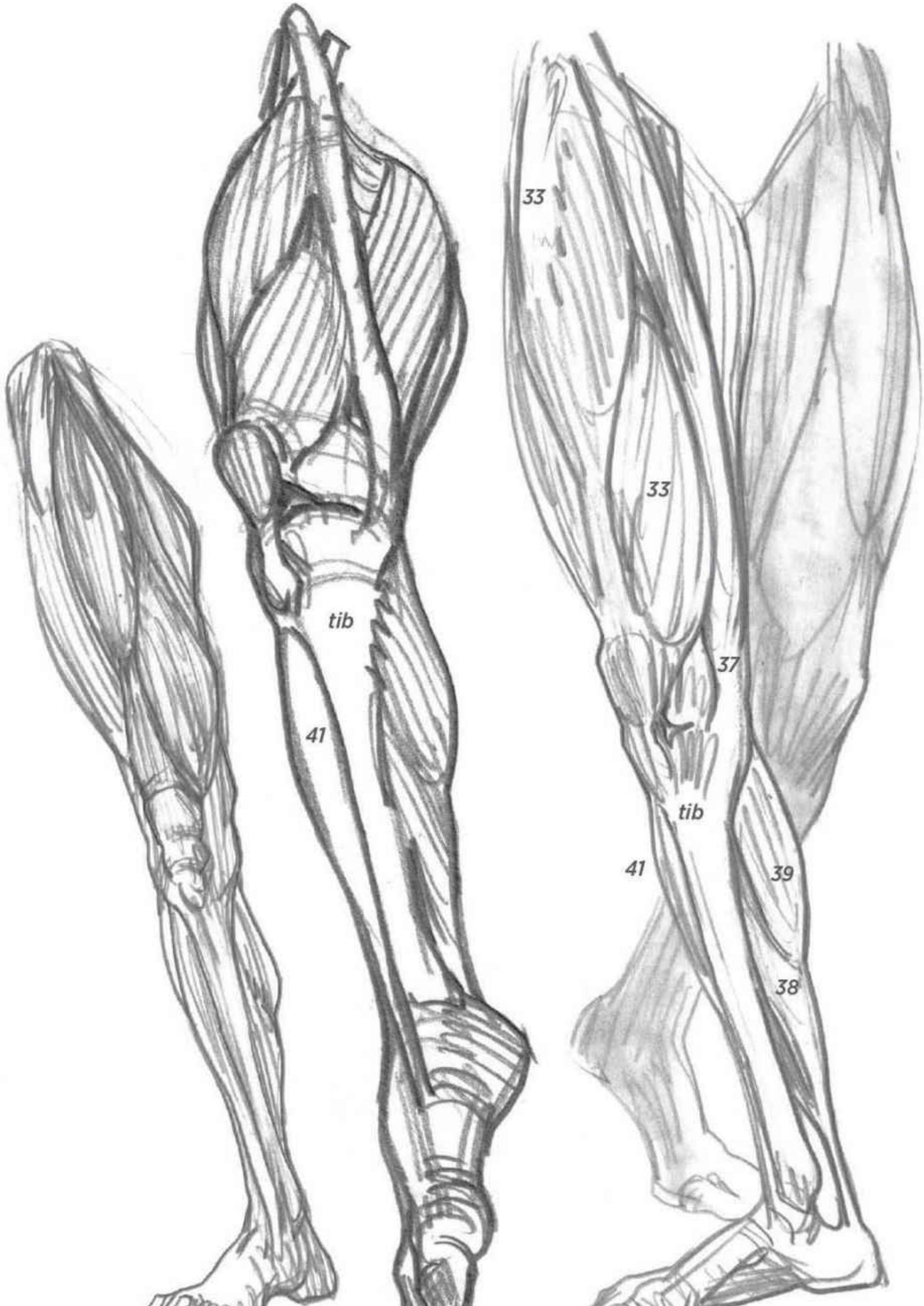


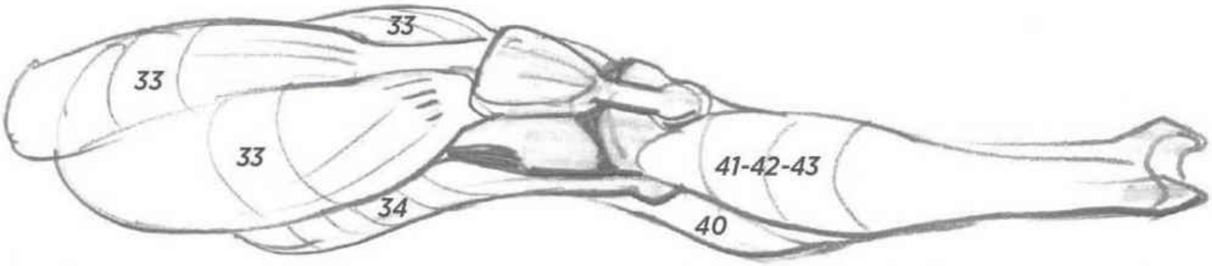
Fig. 2: *The connection between the hamstrings (34) and the gemelli (39 and 40).*

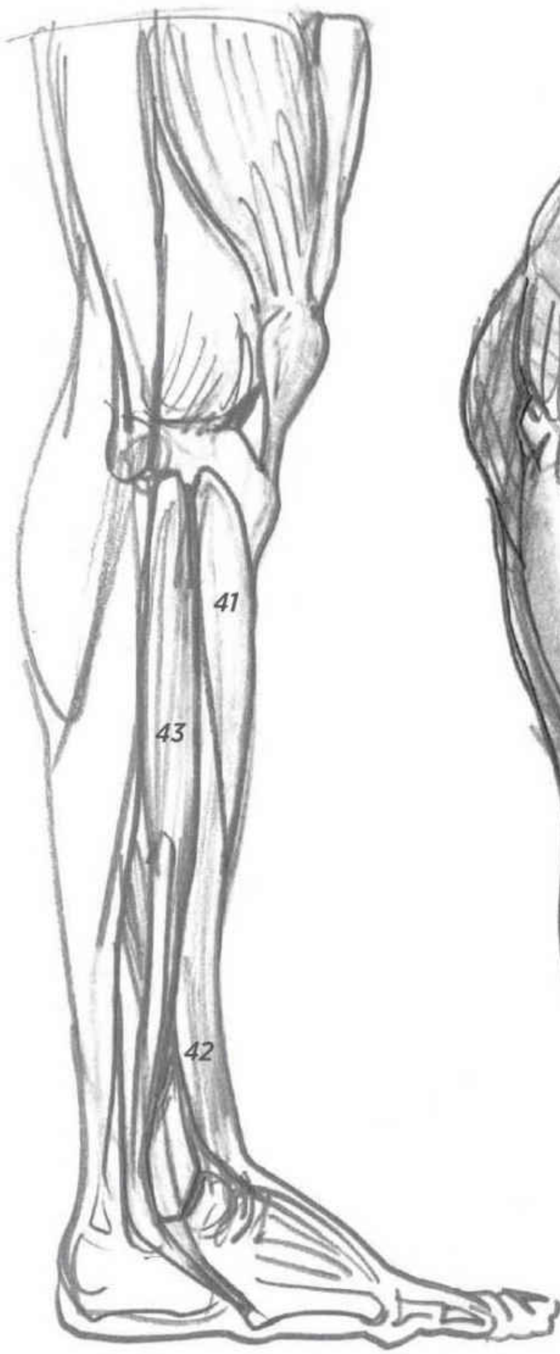

41
tib
fib

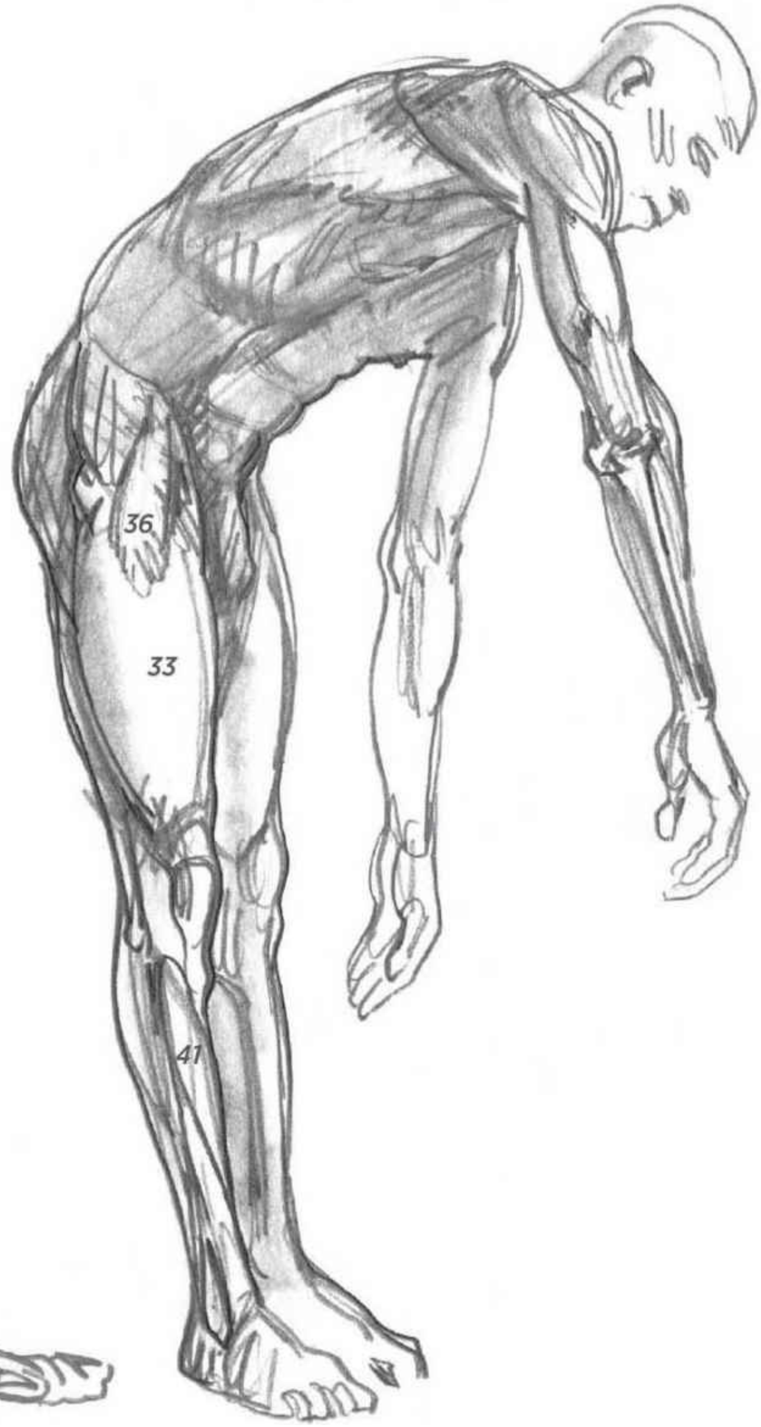
41

36
37
35
33
34
33
tib
39
41
38
44



33
tib
41
33
37
tib
41
39
38


33
33
33
34
41-42-43
40


41
43
42


36
33
41

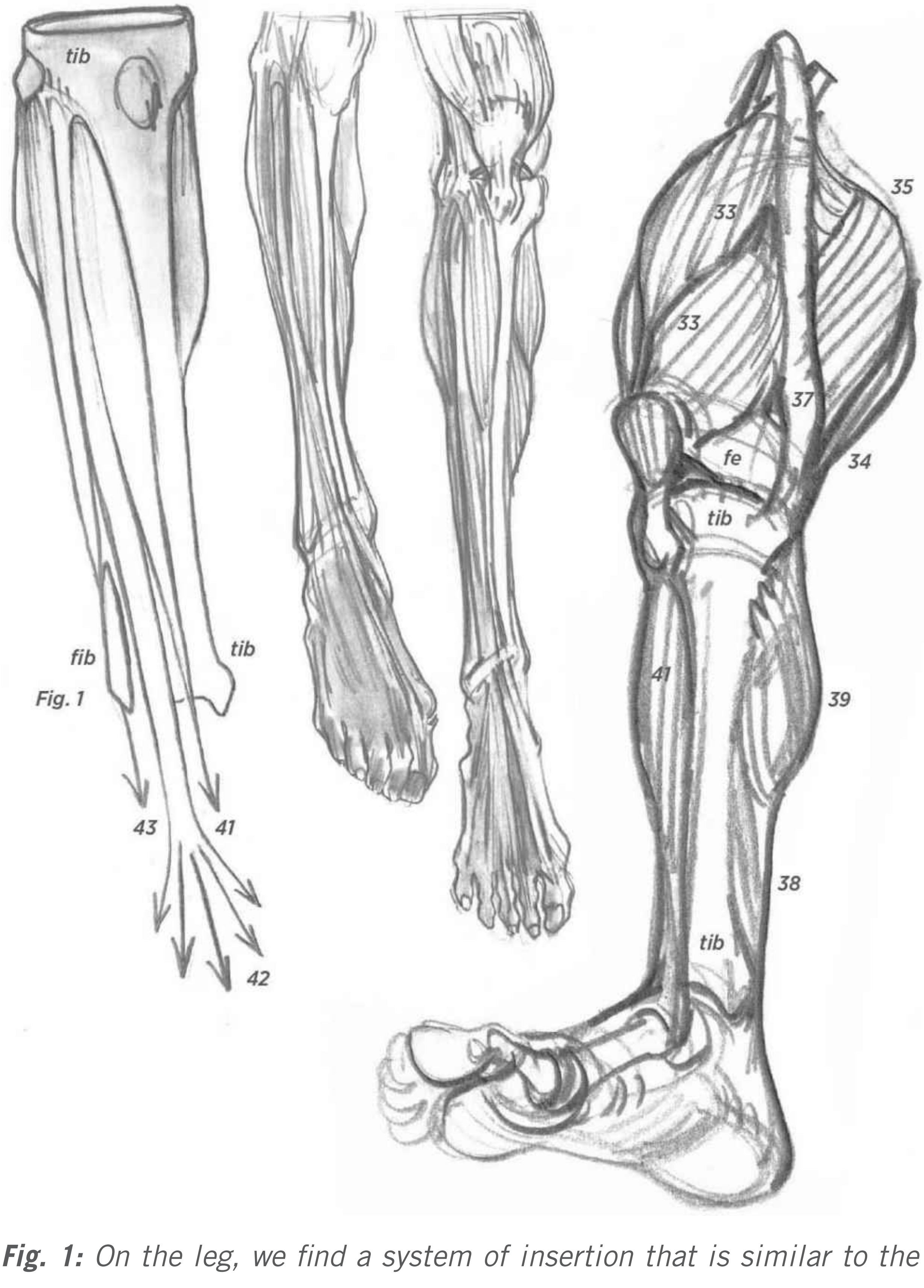
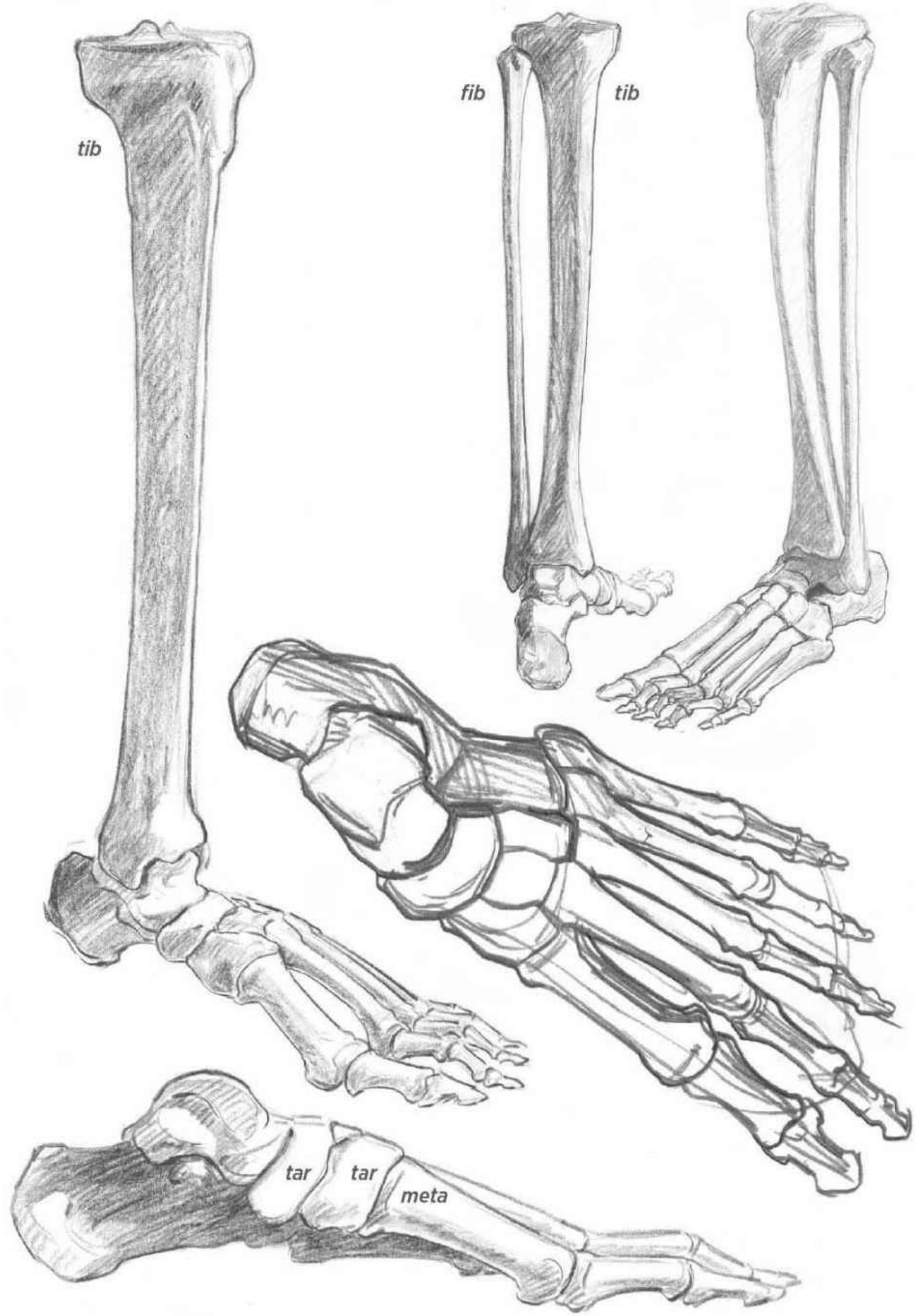
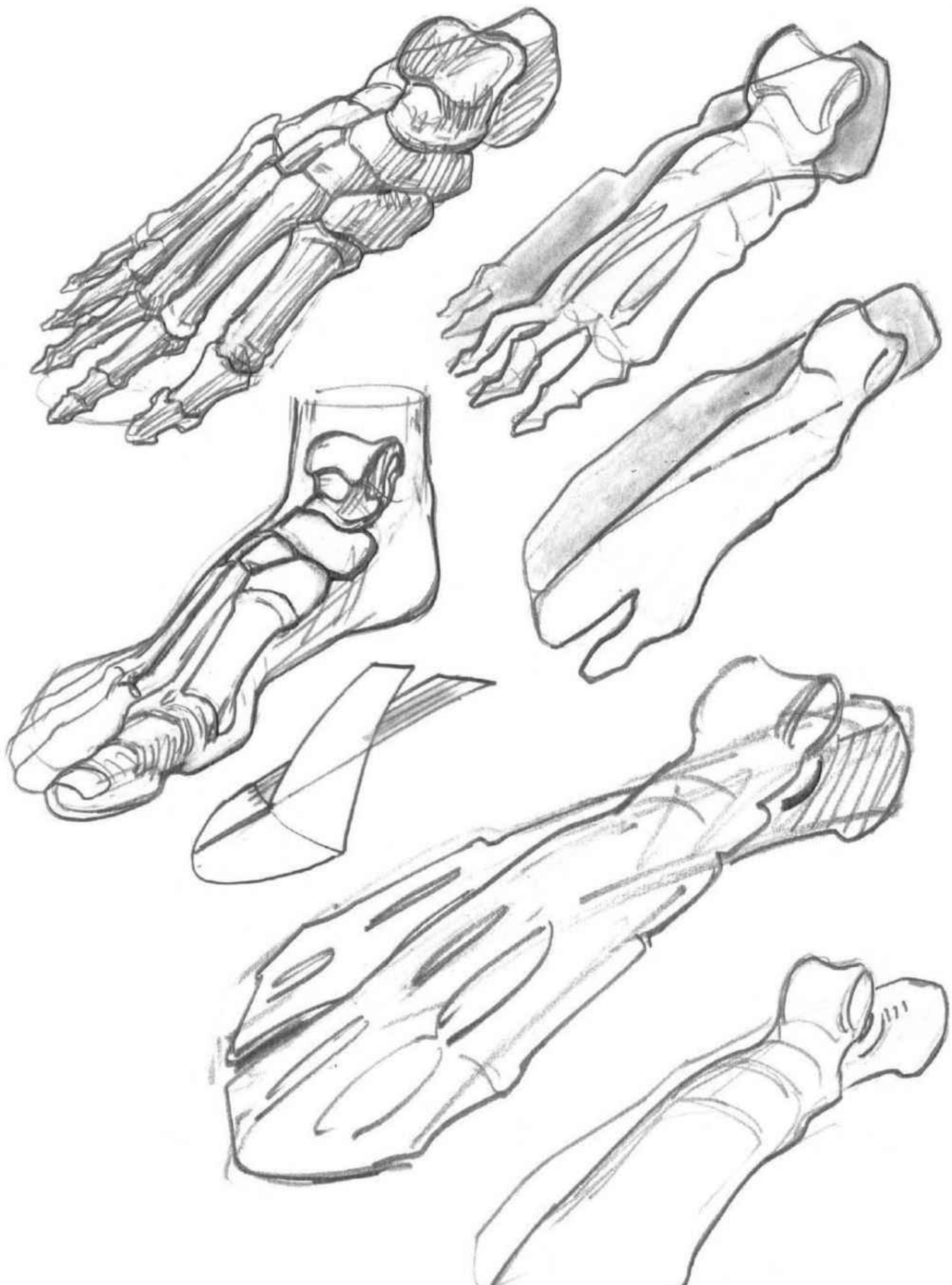


Fig. 1: *On the leg, we find a system of insertion that is similar to the*

extensors of the hand and fingers. Here, also, two shorter bundles surround the digits' actual extensors.

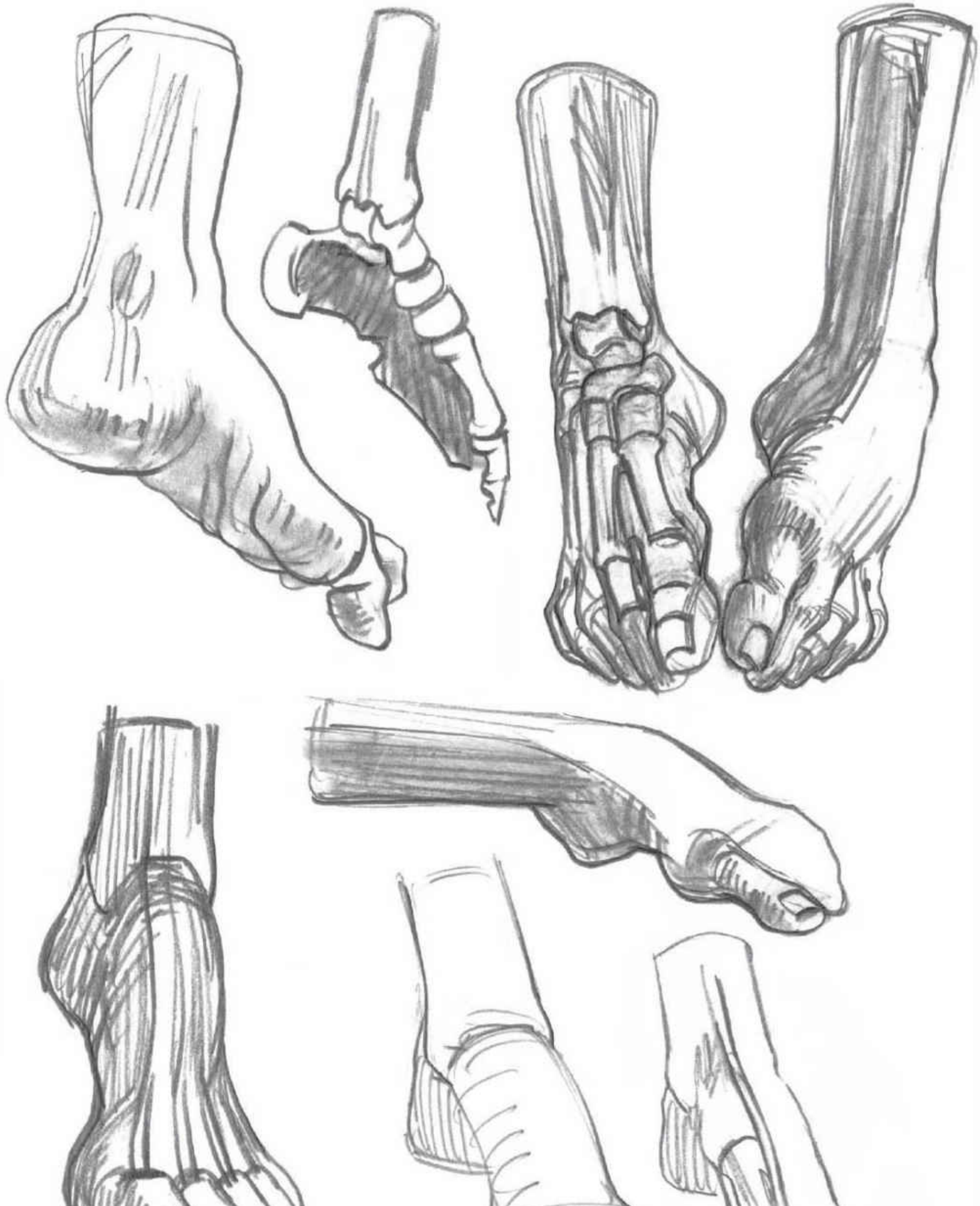

tib
fib
tib
tar
tar
meta

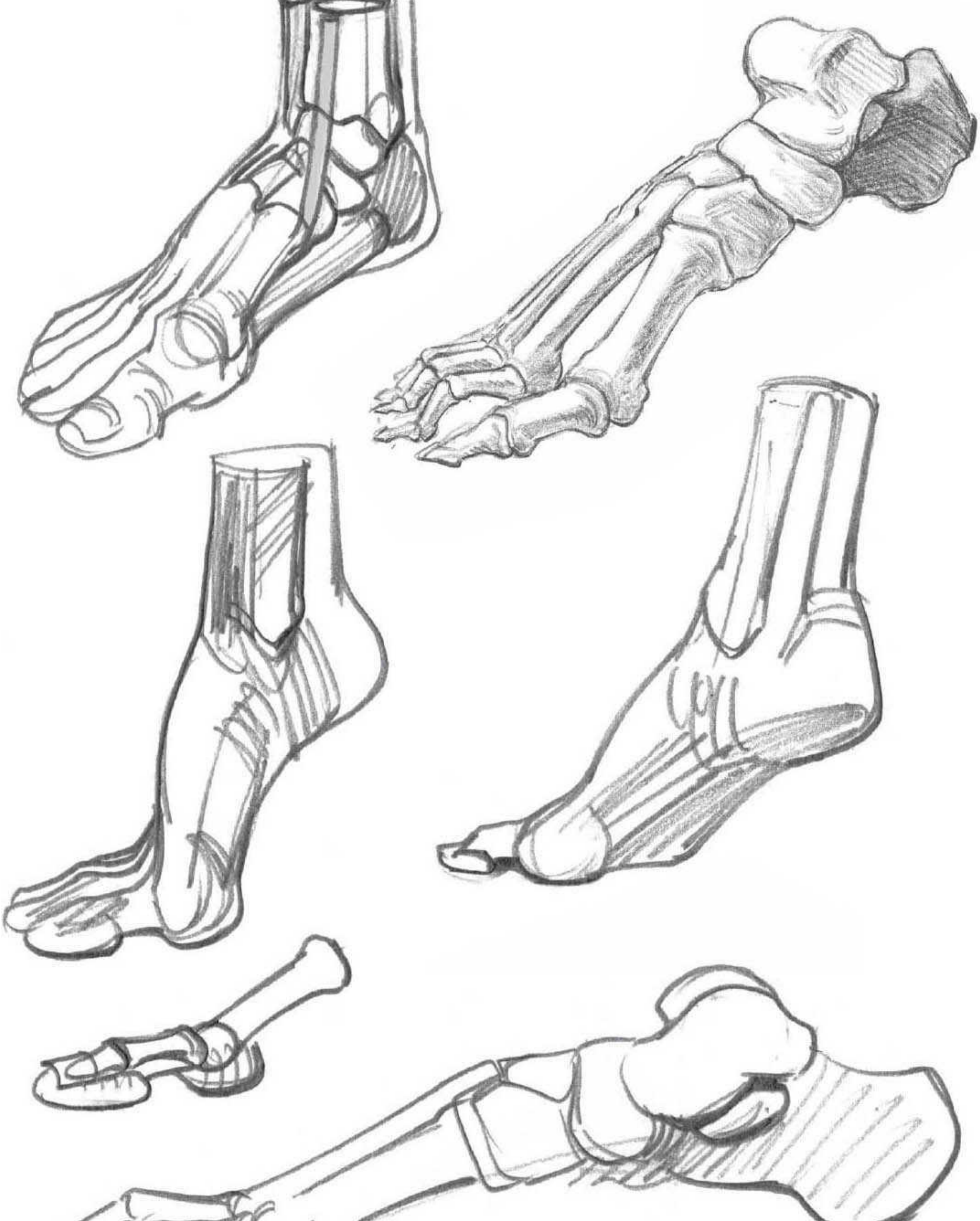


The foot can be divided into two parts: the outer part makes contact with the ground along its entire surface, while the inner part is cantilevered and creates the plantar arch.

The arch of the foot can be thought of as a dynamic bow, whose string

corresponds to the abductor muscle of the big toe (44).





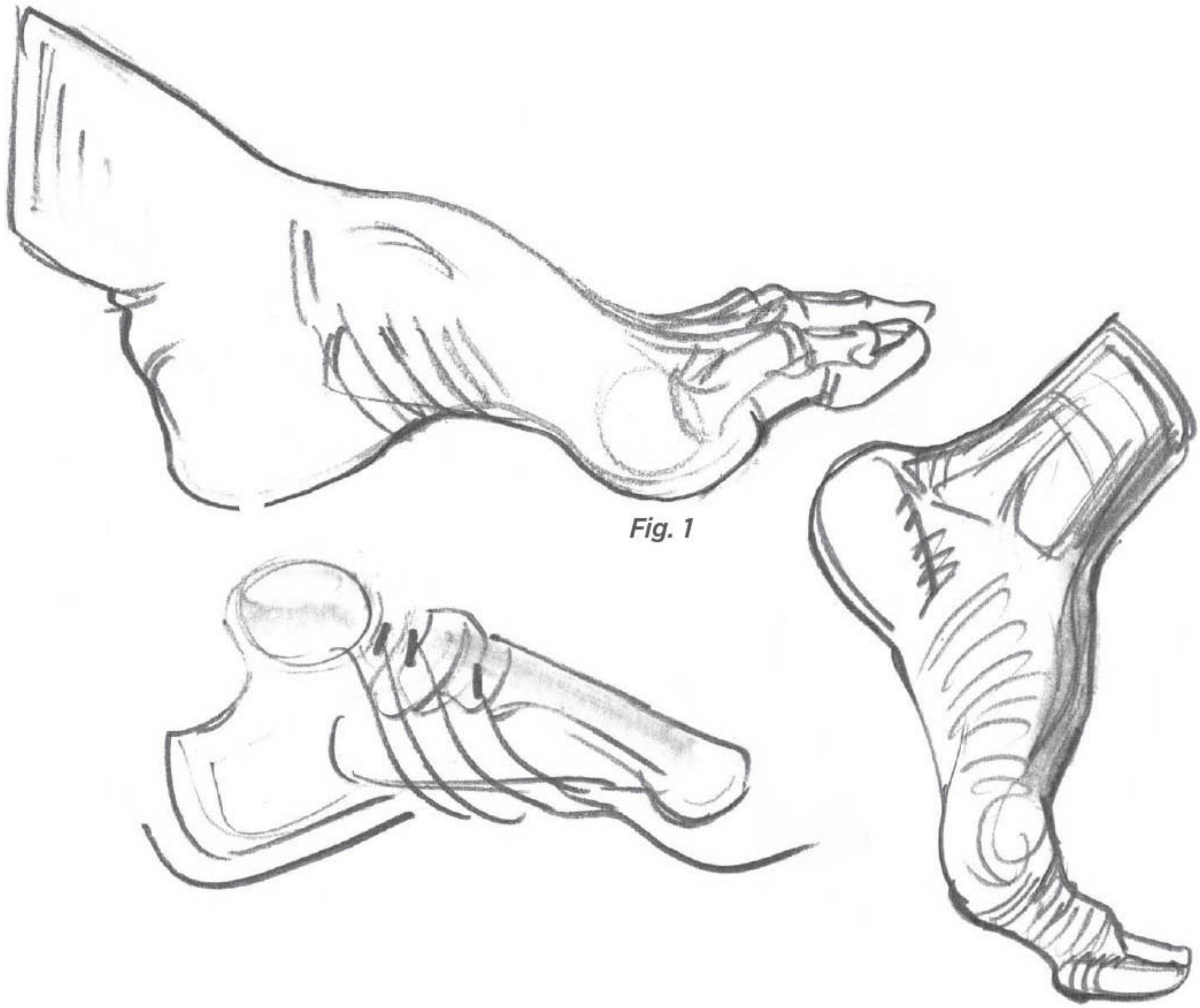


Fig. 1: *The top of the foot is convex. It corresponds to the top of the plantar arch. Folds of skin emphasize its outline here.*

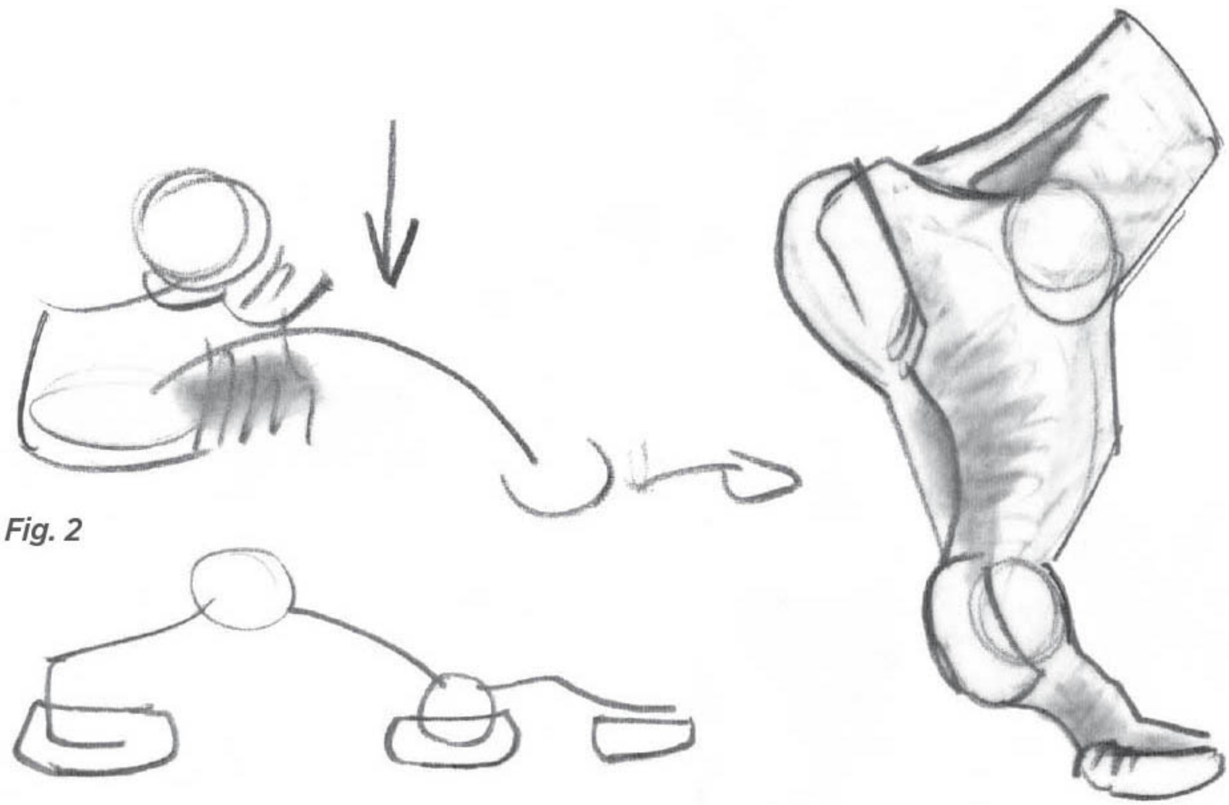
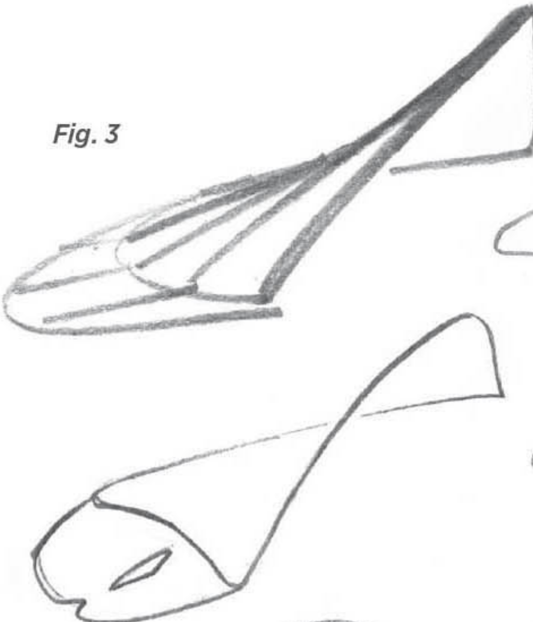


Fig. 2

Fig. 2: *The space under the arch allows the foot to play a shock-absorbing role. The many bones of the tarsus give the foot all the flexibility it needs*.

Fig. 3



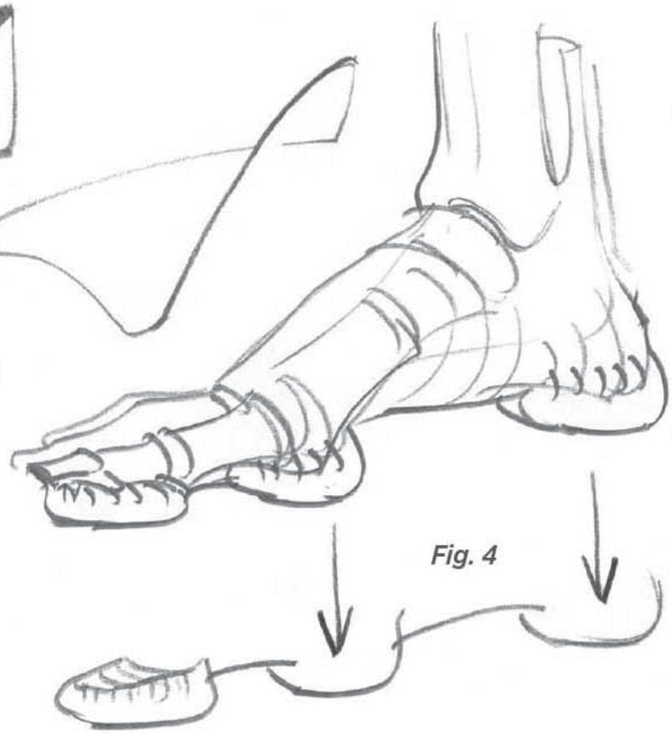


Fig. 4

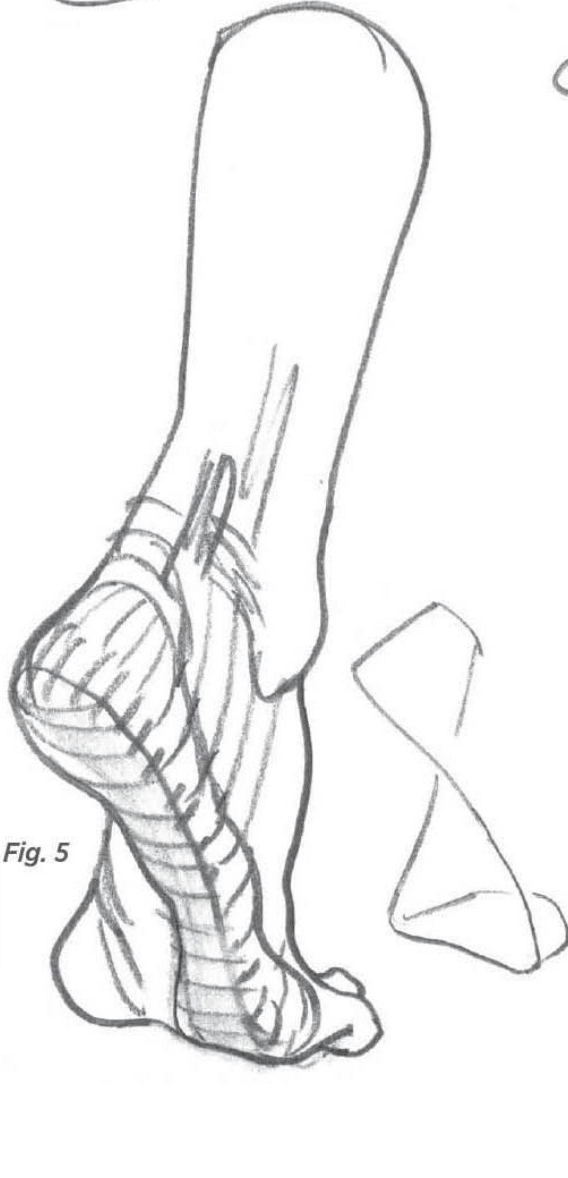


Fig. 5

Fig. 3: *A spiral diagram of the foot*.

Figs. 4 *and* ***5:*** *The fat on the bottom of the foot adds to the shock-absorbing effect*.



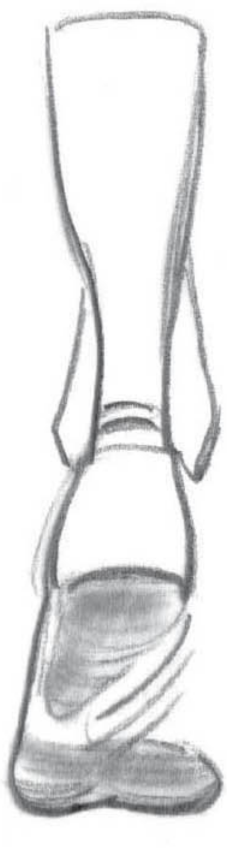
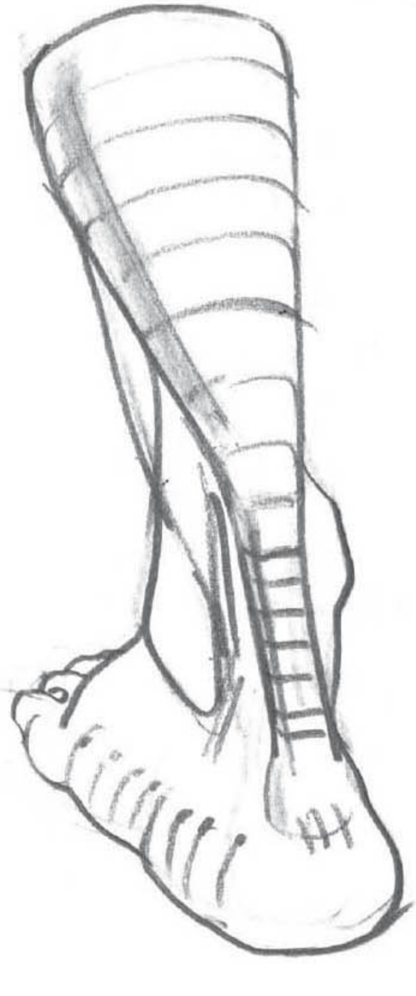




Fig. 1

Fig. 2

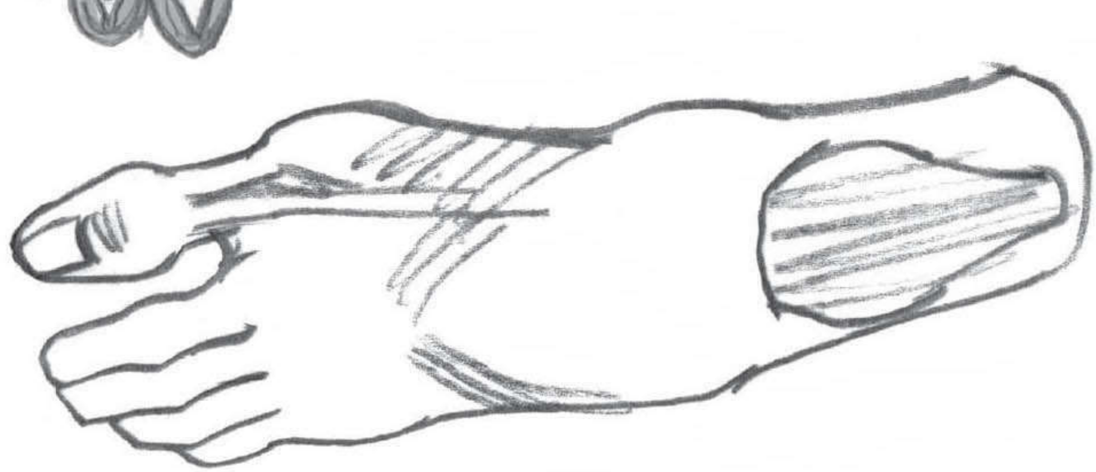


Fig. 1: *Skeleton of the foot, seen from above, superimposed on its footprint on the ground. The fat of the foot protects the heads of the metatarsals, absorbs shocks, and broadens the surface of contact*.

Fig. 2: *The tendons of the anterior tibialis (shaded) and the shared toe extensor*.

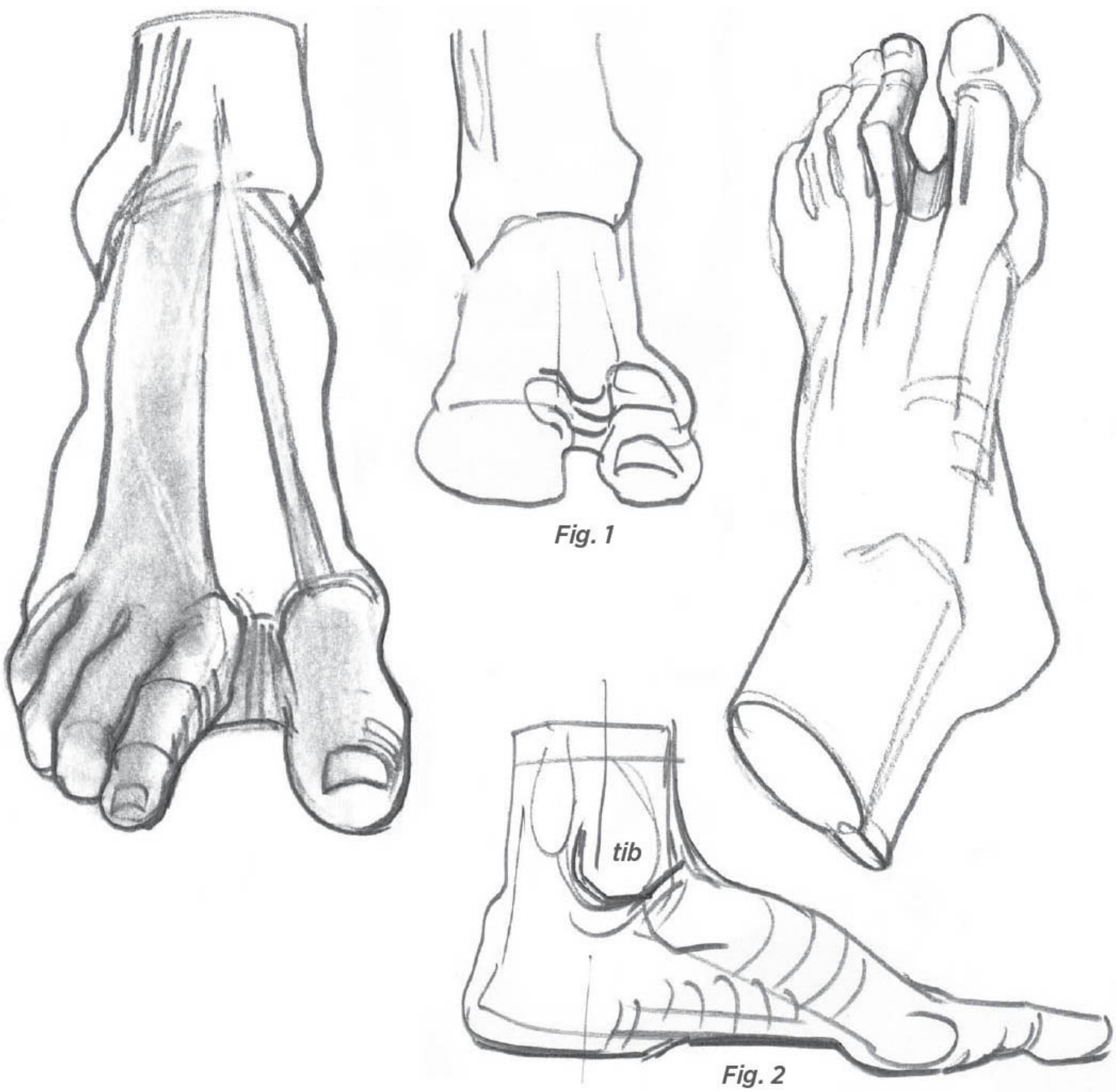
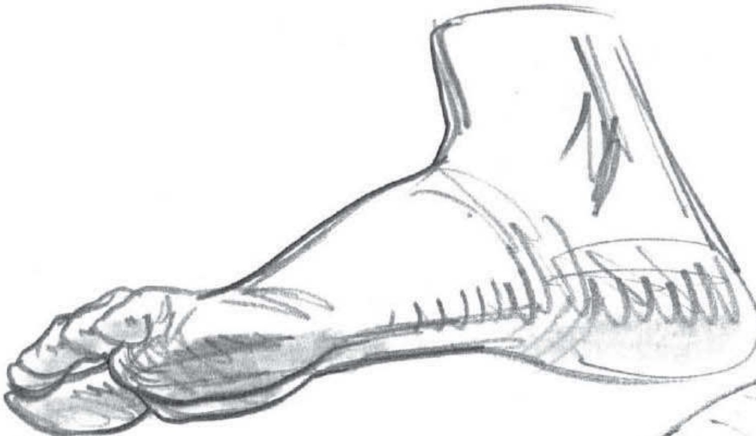
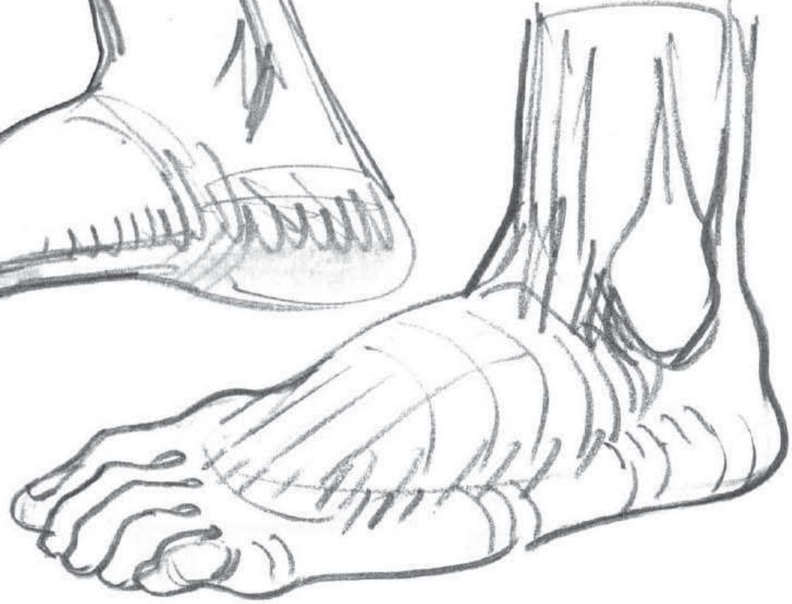


Fig. 1: *As on the hand (and for similar reasons), we find here folds of skin between the digits. The heads of the metatarsals are protected on the plantar side by a pillow of fat that creates a gap between the upper and lower sides of the foot. This gap takes the shape of intermediate planes between the toes*.

Fig. 2: *Internal view. The raised arch creates a shift in the contour of the foot. On this side, the ankle (tib) is higher, wider, and further forward*.





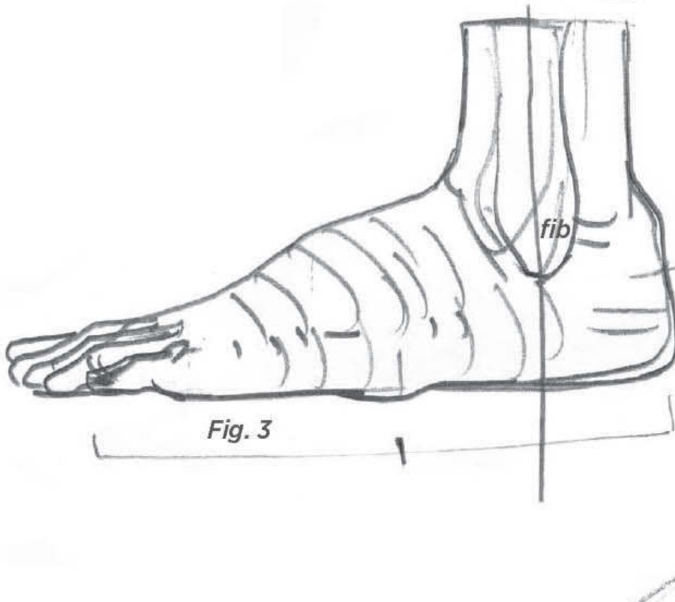


Fig. 3

Fig. 3: *External view. The foot touches the ground along its entire length. The metatarsal starting at the little toe creates a protrusion halfway between the heel and the end of that toe. On the profile of a so-called "Egyptian foot" or a "Roman foot" all the toes should be drawn, whereas on a "Greek foot," the second toe, being longer, can hide the big toe. The ankle (fib) on this side is lower, more delicate, and closer to the center.*

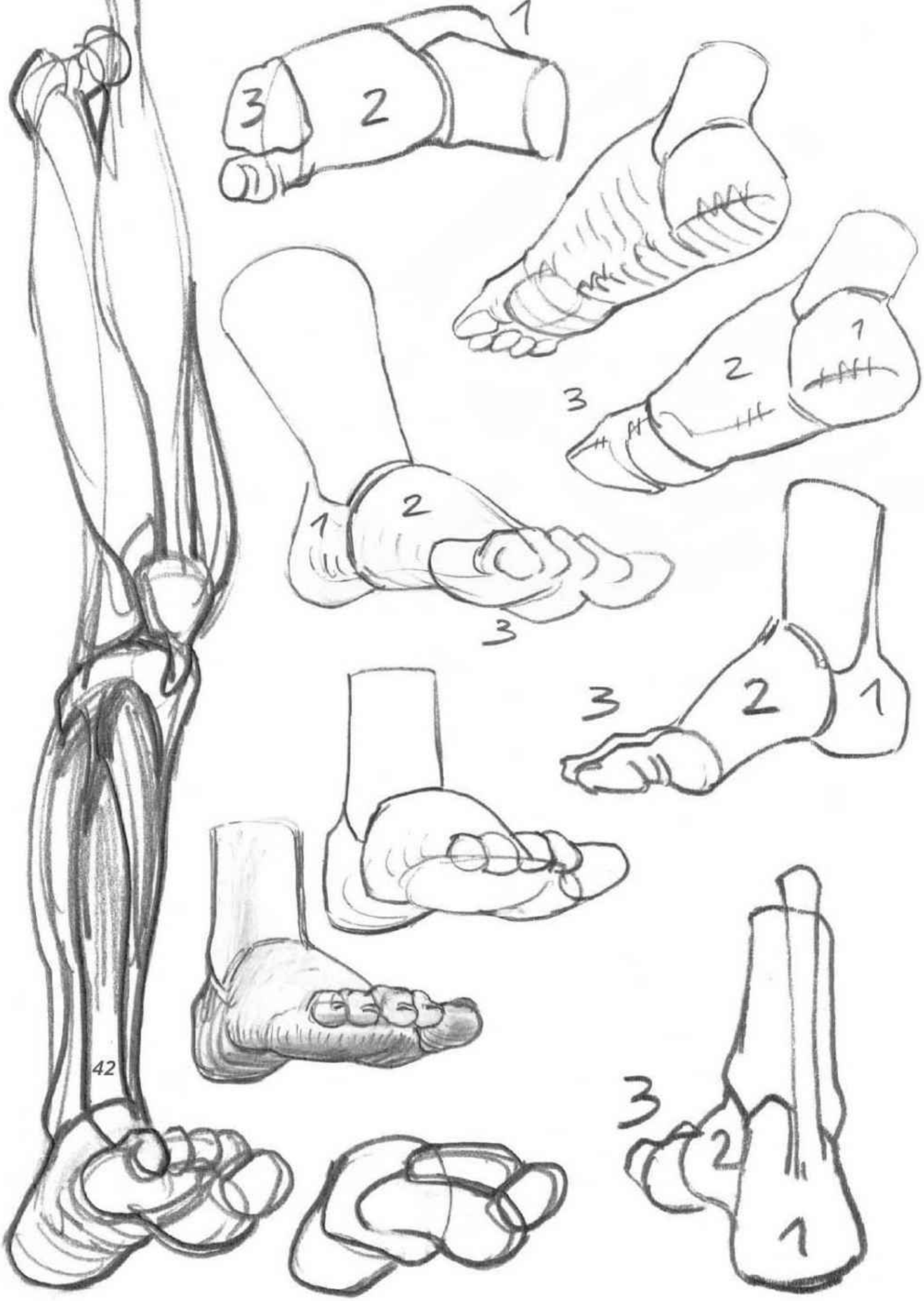
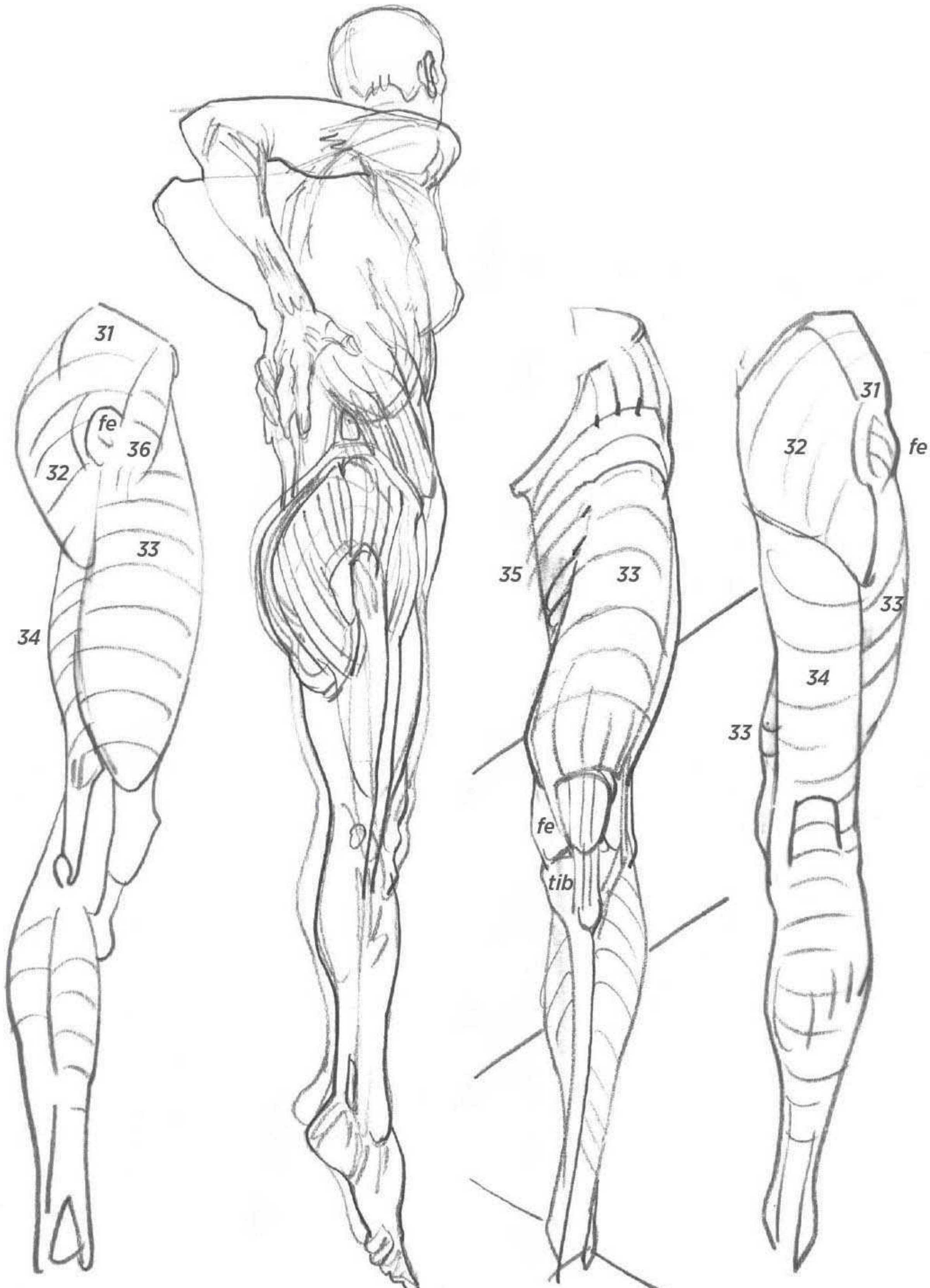

1
3
2
1
2
3
3
2
1
3
2
1
3
2
1

Fig. 1: *The shaded print shows the various support points.*
Fig. 2: *The footprint this foot will leave on the ground is interrupted before the heel, which is the sign of an extra-high arch.*
Fig. 3: *The tendons of the shared extensors (42) wrapped around the back.*

Fig. 4: *Internal view showing the connection between the adipose pads and the intermediate contours*.


31
fe
36
32
33
34
35
33
fe
tib
31
32
fe
33
34
33

The hamstrings (34) and the adductors (35) form a common mass. The quadriceps (33) follow the oblique trajectory of the femur. They are powerful and can be seen in the contours of a view from the rear.

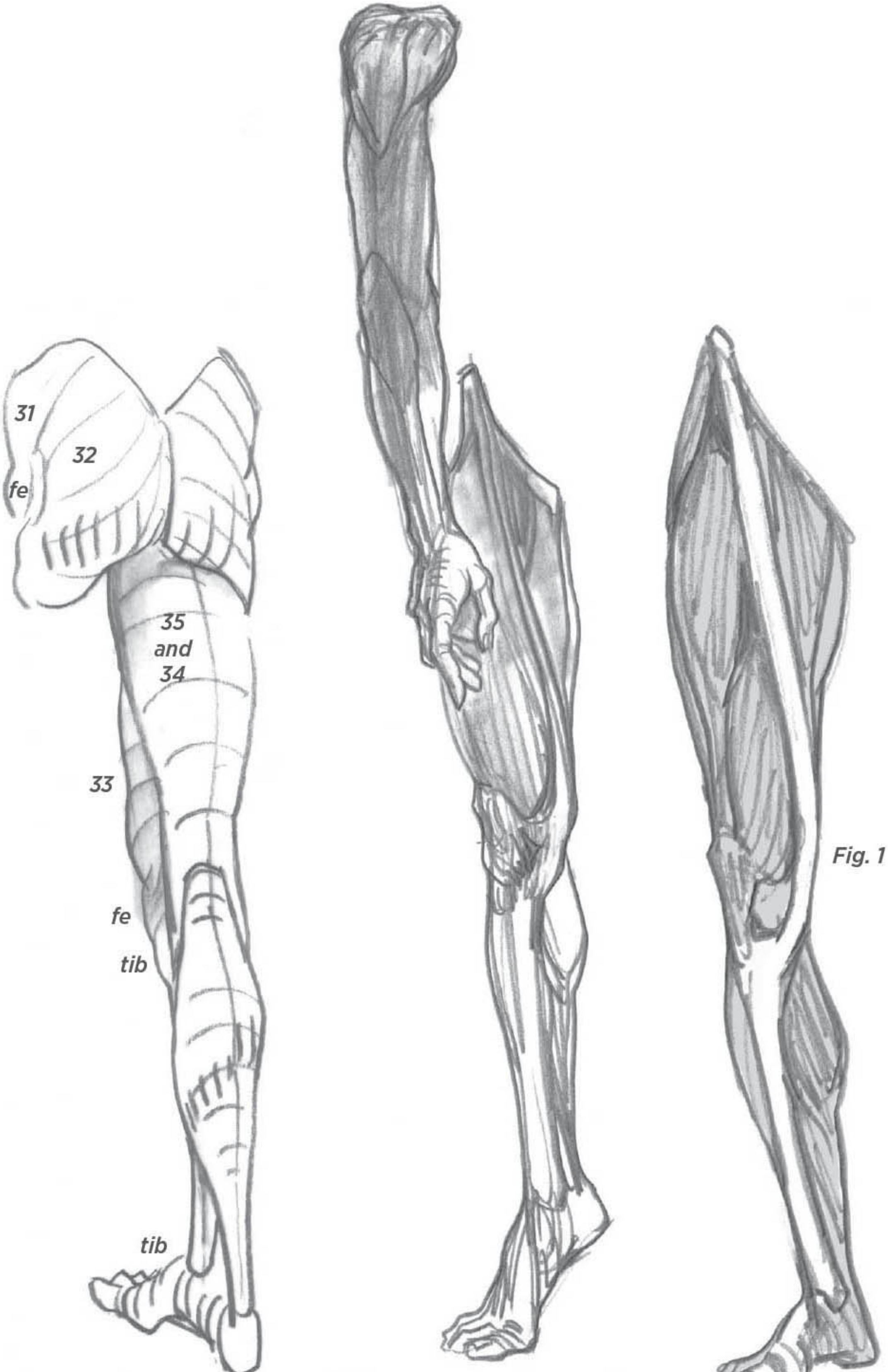


Fig. 1

Fig. 1: *Connections between the sartorius, the tibia, and the first metatarsal.*

In a frontal view we can highlight the curves of the thigh and leg segments, which echo each other elegantly.

In the outside contour, the convexities are higher and longer in each segment.

Along the inside contour of each of the two segments, the convexities are split, more marked, and fleshier.

"Contour re-entries" (contours that take turns passing in front of each other) are an expression of overlapping planes.

On the thigh, the quadriceps, attached to the femur, passes obliquely in front of the adductors.

On the leg, although the calf (gemelli) takes up almost the entire shape, the extensors also run obliquely down the front.

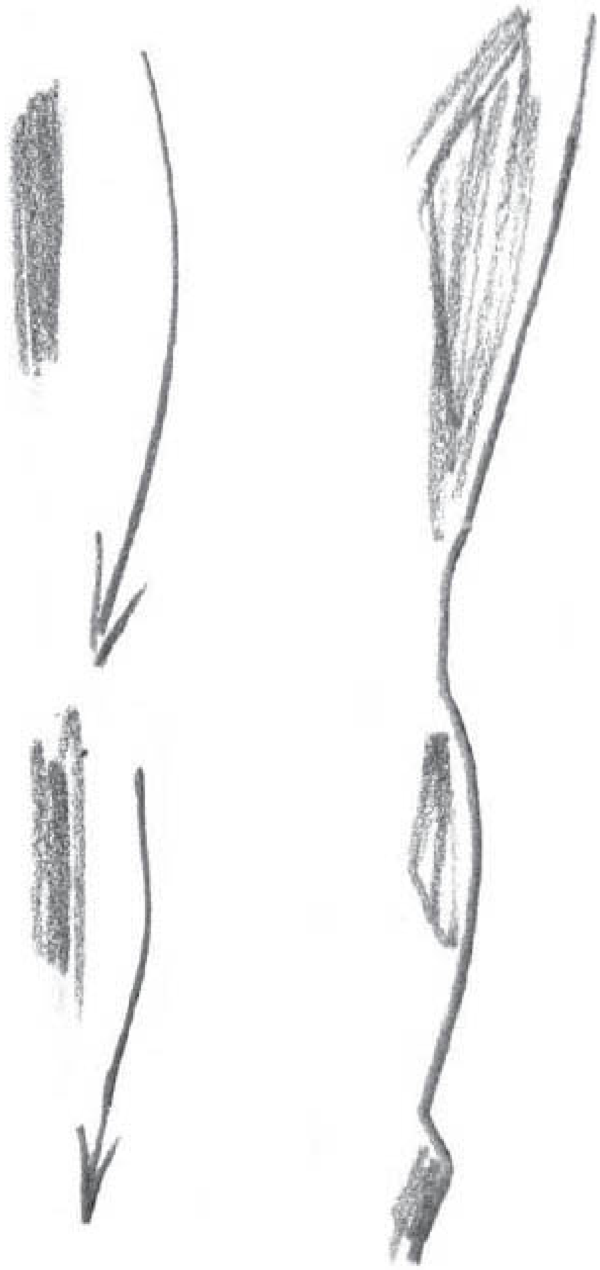


Fig. 1

Fig. 1: *The thigh and the leg are built by superimposing a prior volume that rolls down the axis of the limb, starting from the outside, thus causing the internal volume to move into the background.*

Fig. 2

Fig. 2: *The shift in the contours (or curves) also highlights the similarities between the two segments. At the ankle, the malleoli formed by the tips of the tibia and the fibula, contradict the echo between the thigh and the leg.*

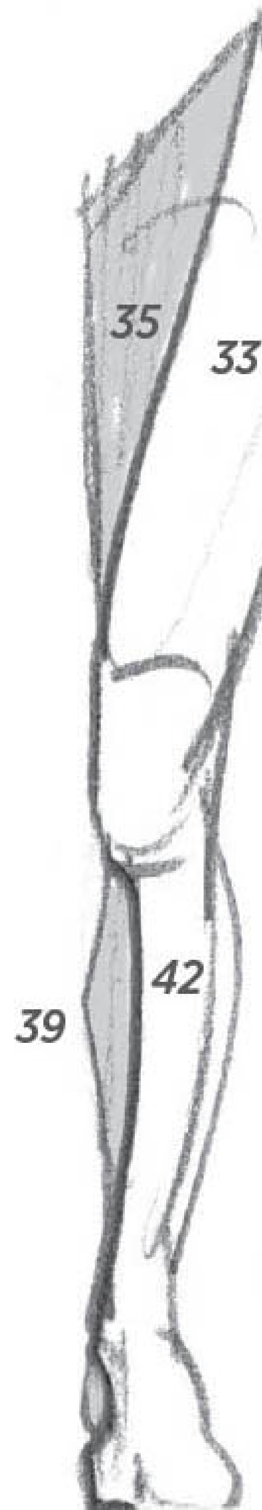


Fig. 3

Fig. 3: *A sinuous line reinforces the superimposition of the planes. On*

the thigh, the line corresponds to the sartorius muscle, which slips between the quadriceps (33) and the adductors (35). On the leg, from the knee to the ankle, the tibia creates the corresponding line. On the foot, this construction line shapes the arch and separates the heel from the rest of the foot.

Fig. 4

Fig. 4: *The fat reinforces the convexities.*

overviews

In these drawings, the shaded areas correspond to the locations of fat. On the limbs, we see the thickness of fat diminishes as we move from the root to the extremities. The fat located behind the triceps (subdeltoid) is reminiscent of the fat behind the hips (subtrochanteric).

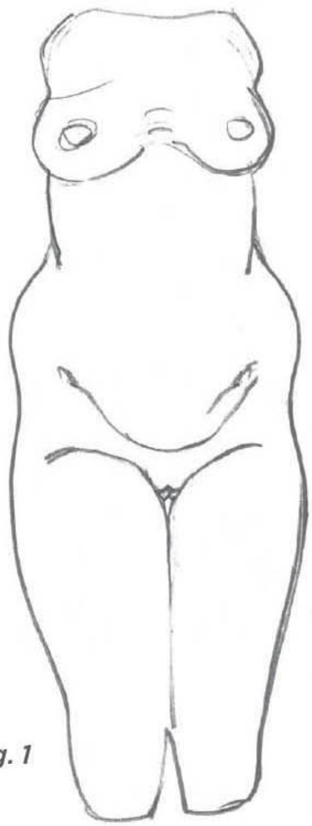


Fig. 1

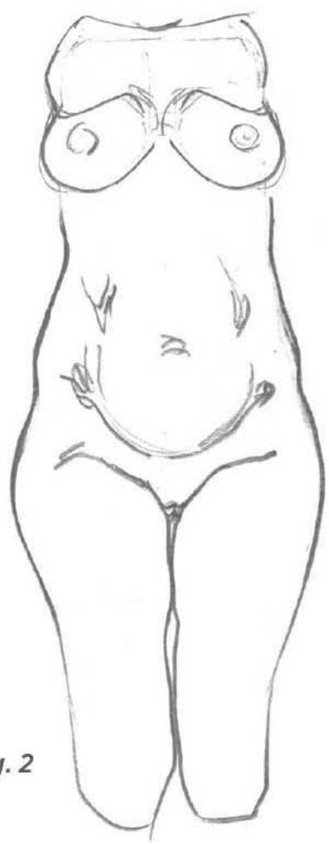


Fig. 2


Fig. 3

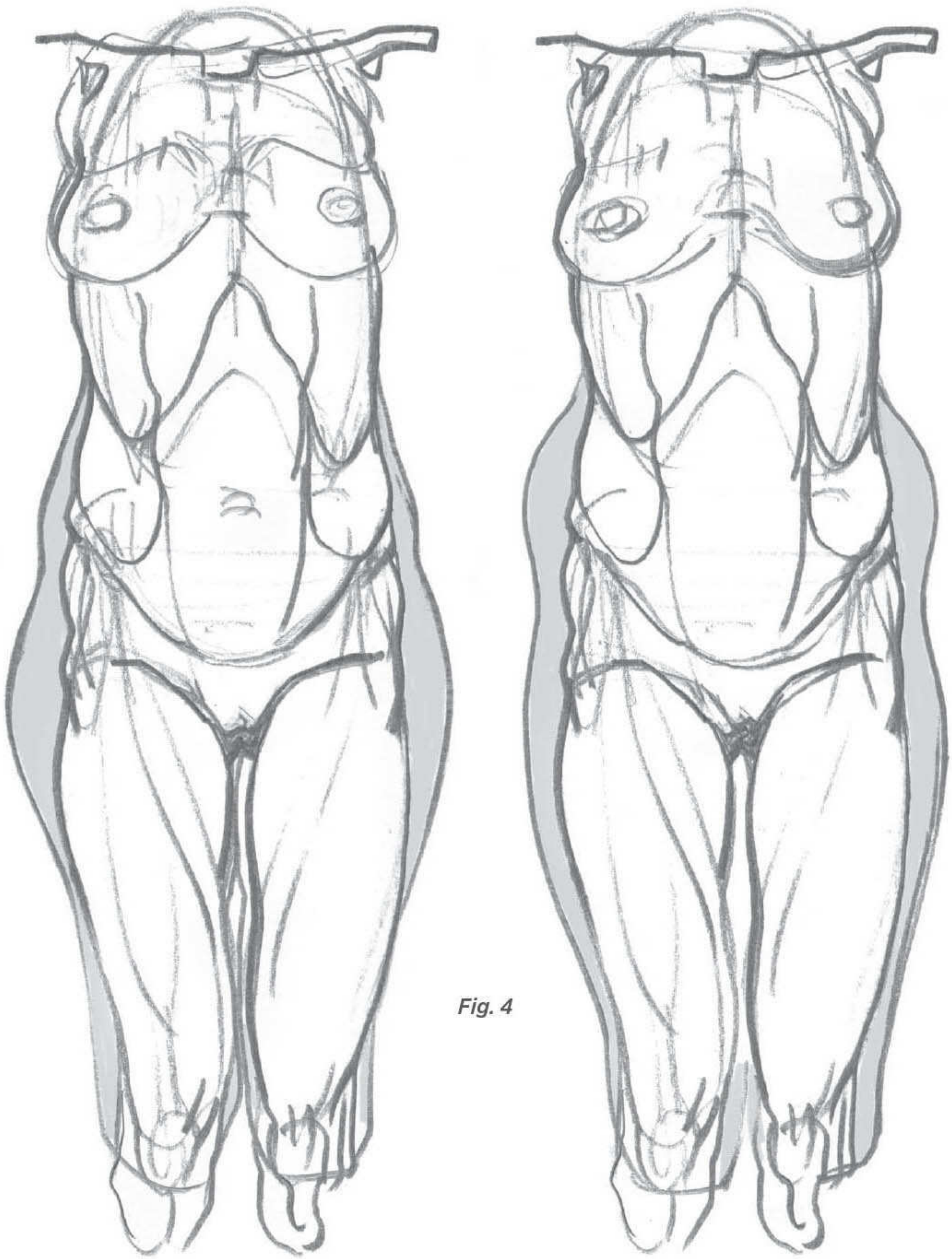
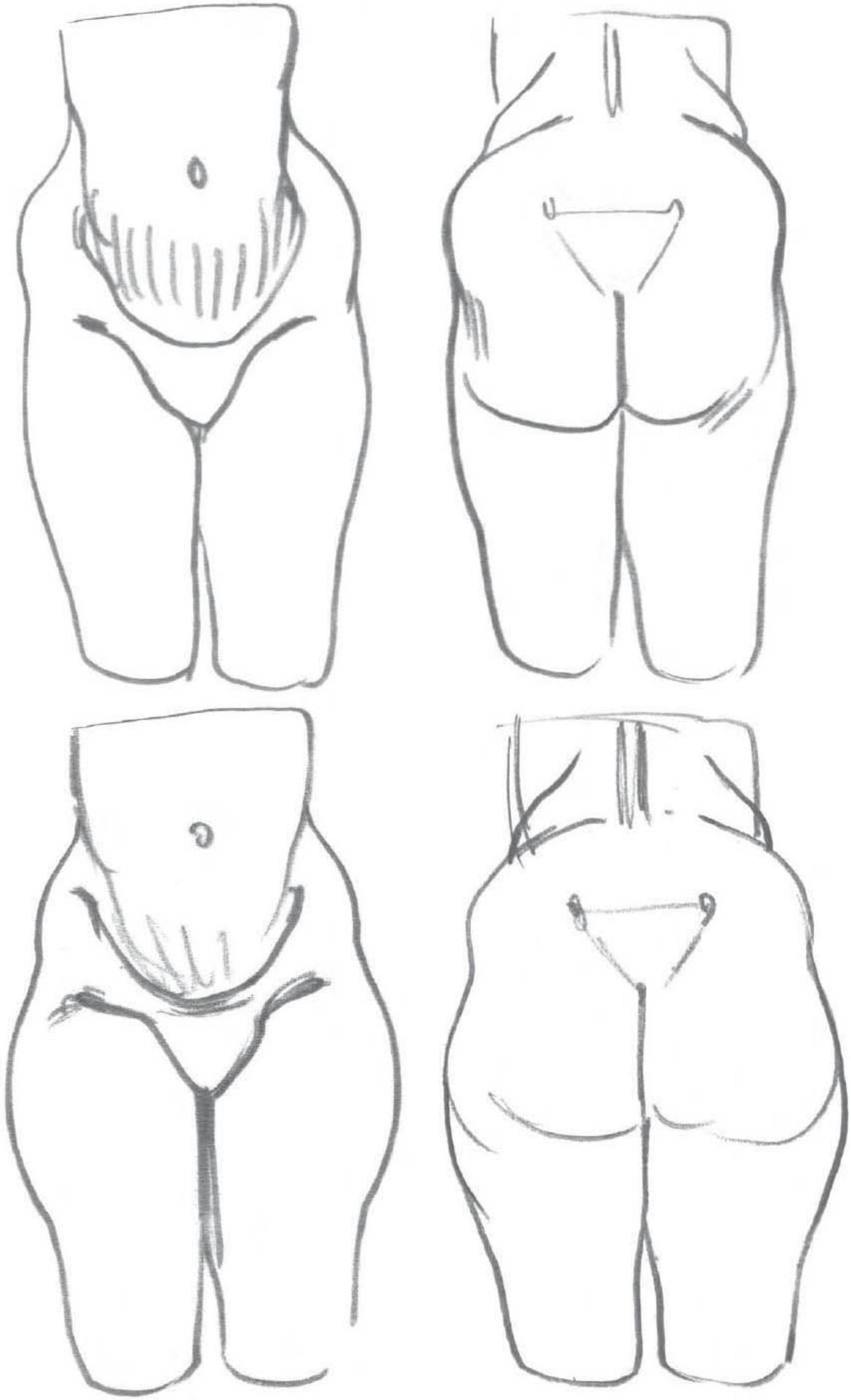
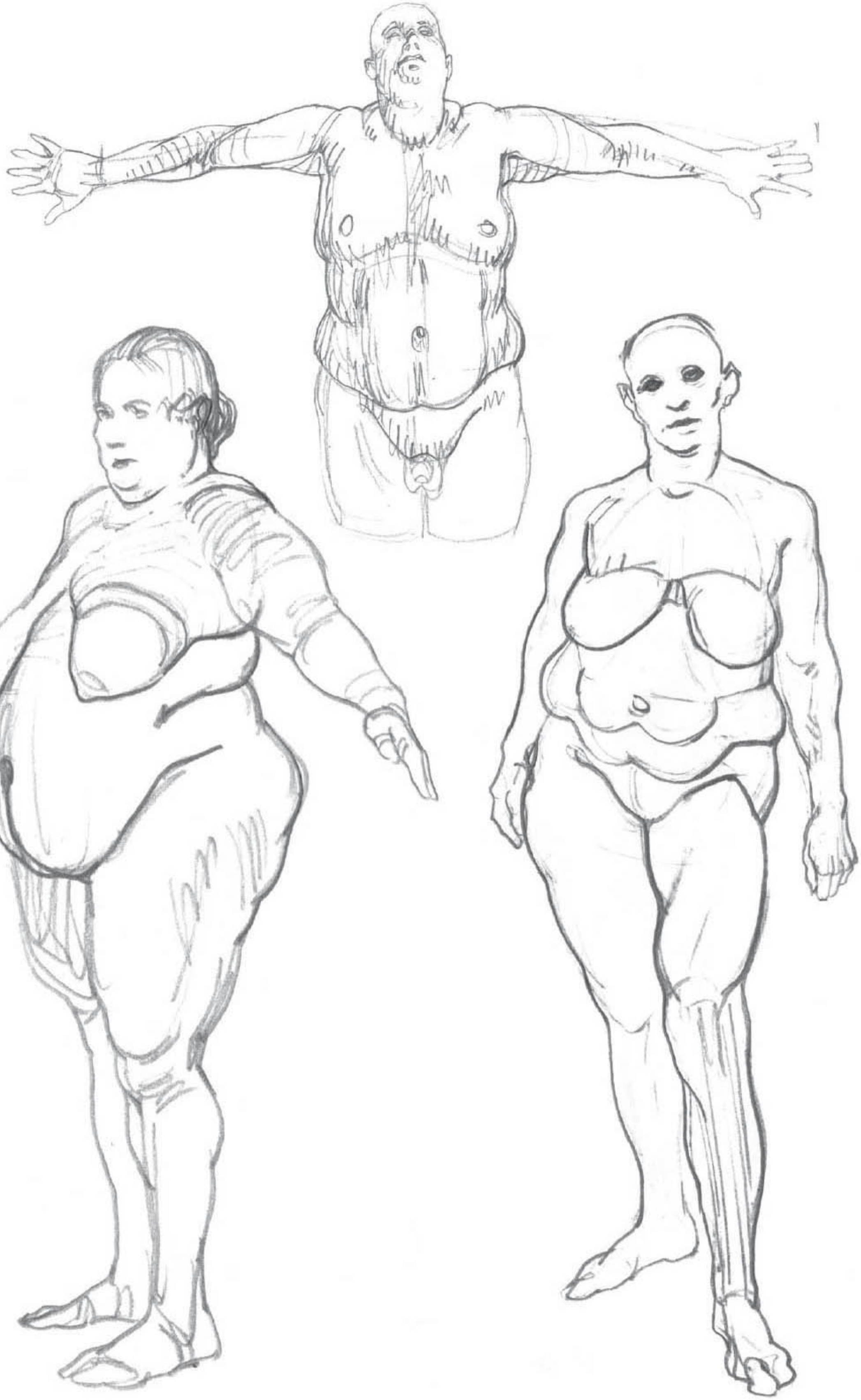


Fig. 4: *Two silhouettes (Figs. 1 and 2) superimposed on an écorché*

figure (Fig. 3) demonstrate the variety of forms fat may take.



A variety of fatty shapes.




1
2
3
4
1
2
3
4

Fatty shapes do not always coincide with the skeleton or the musculature.

In these drawings, the area marked 2 corresponds to the rib cage. The areas marked 1, 3, and 4 are due to fat.

From the front, number 3 could be confused with the external oblique muscle, but as it ascends up the back, it creates a shape that is its own.

Fat is usually thicker around the pelvis (i.e., the lower abdomen, buttocks, hips, and upper thighs).


rib
7

sacr

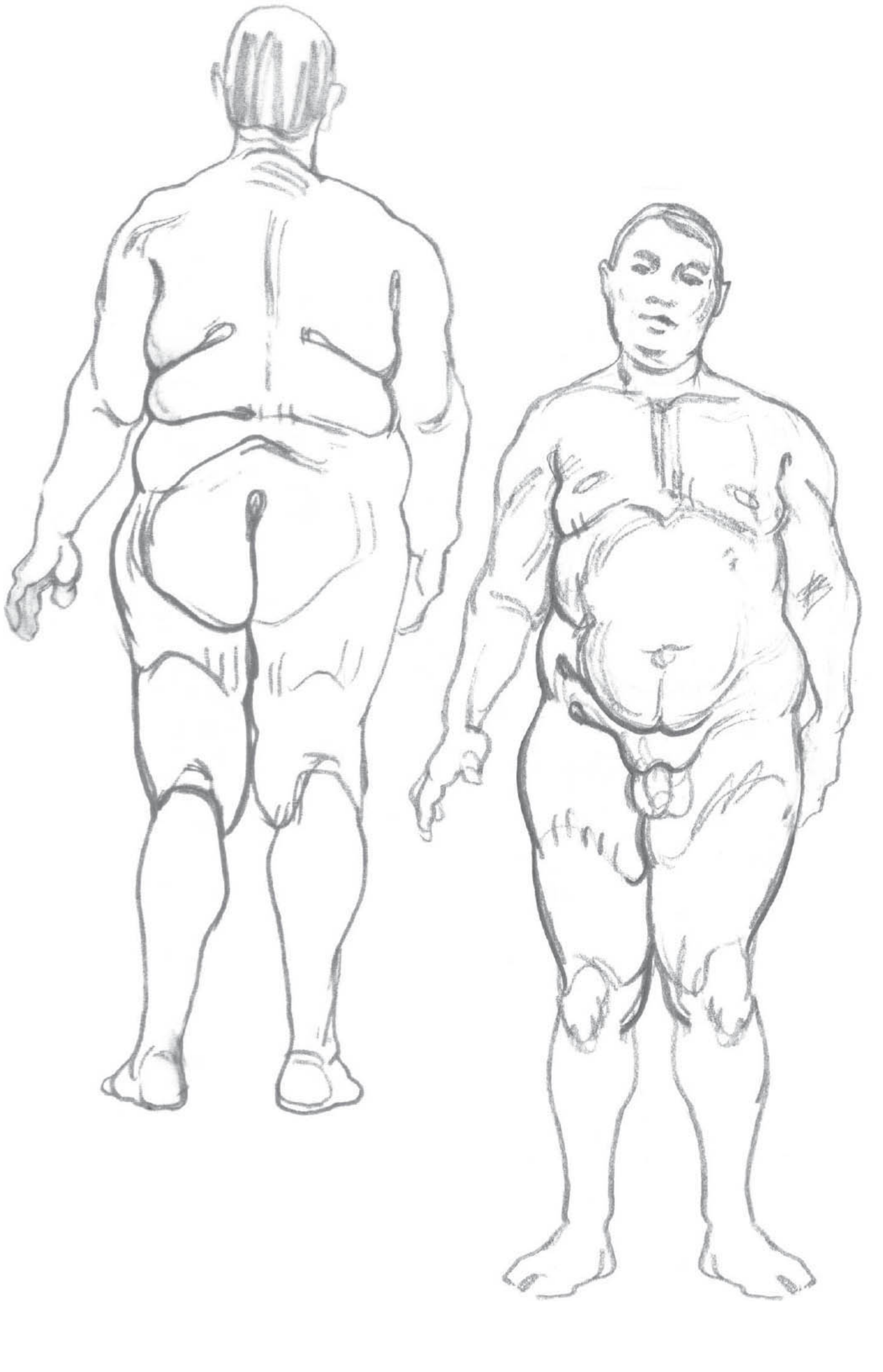
On the back, fat can cover the wings of the pelvis. Starting at the buttocks, the shapes narrow as they rise along the back.

The sacrum can be found in the dip between two dimples (where the skin adheres to the pelvis) and the beginning of the intergluteal cleft.

Here we see a female model on the left and a male model on the right.

Fat can blur sexual characteristics. For example, on the male model, the fat on the upper thighs connects with the fat on the side, covering the outline of the pelvis along the way.

In these drawings, one can see a mass that connects the breast to the tip of the scapula, which is a result of subcutaneous fat. This characteristic is found in males as well, underneath a pectoral enlarged by a layer of fat that starts under the nipple.



Fat is seen in similar forms in both sexes, especially wherever movements create folds of flexion.

Nevertheless, certain areas of the body do offer so-called "sexual" characteristics.

On a male model, fat is more likely to be located above the wing of the pelvis, adding to the volume of the flank.

Fat will often entirely cover the wing of the pelvis, thus accentuating the waist.
It is more common to find this characteristic on a female model.


Fig. 1

Fig. 1: *Although fat is found on the surface, it cannot, by itself, explain all shapes any more than can musculature. The skeleton remains apparent at many points under the skin.*

Fat—superimposed here on an écorché figure (showing both skeleton and musculature)—enriches the drawing of the body, adding a third system of shapes.

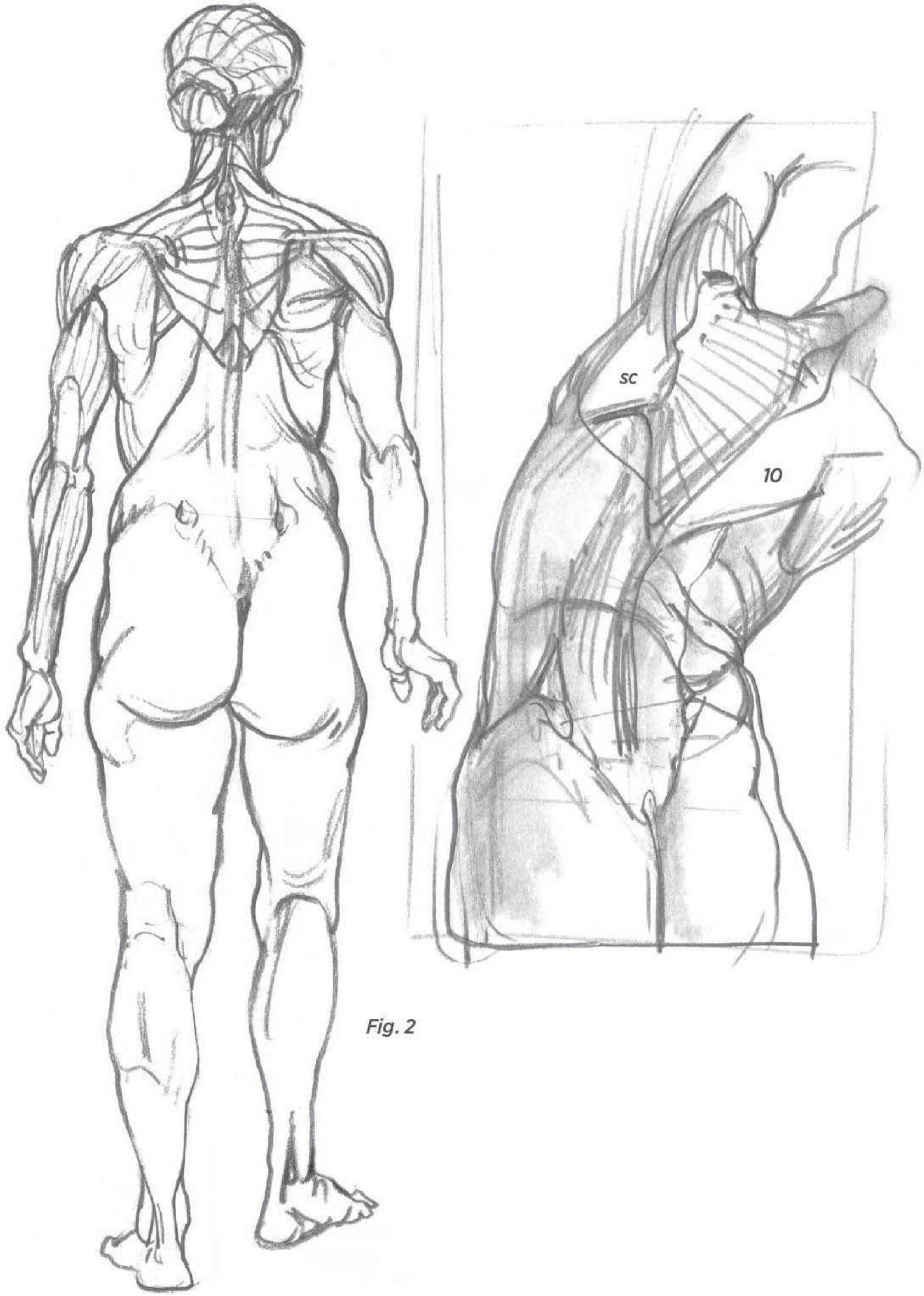
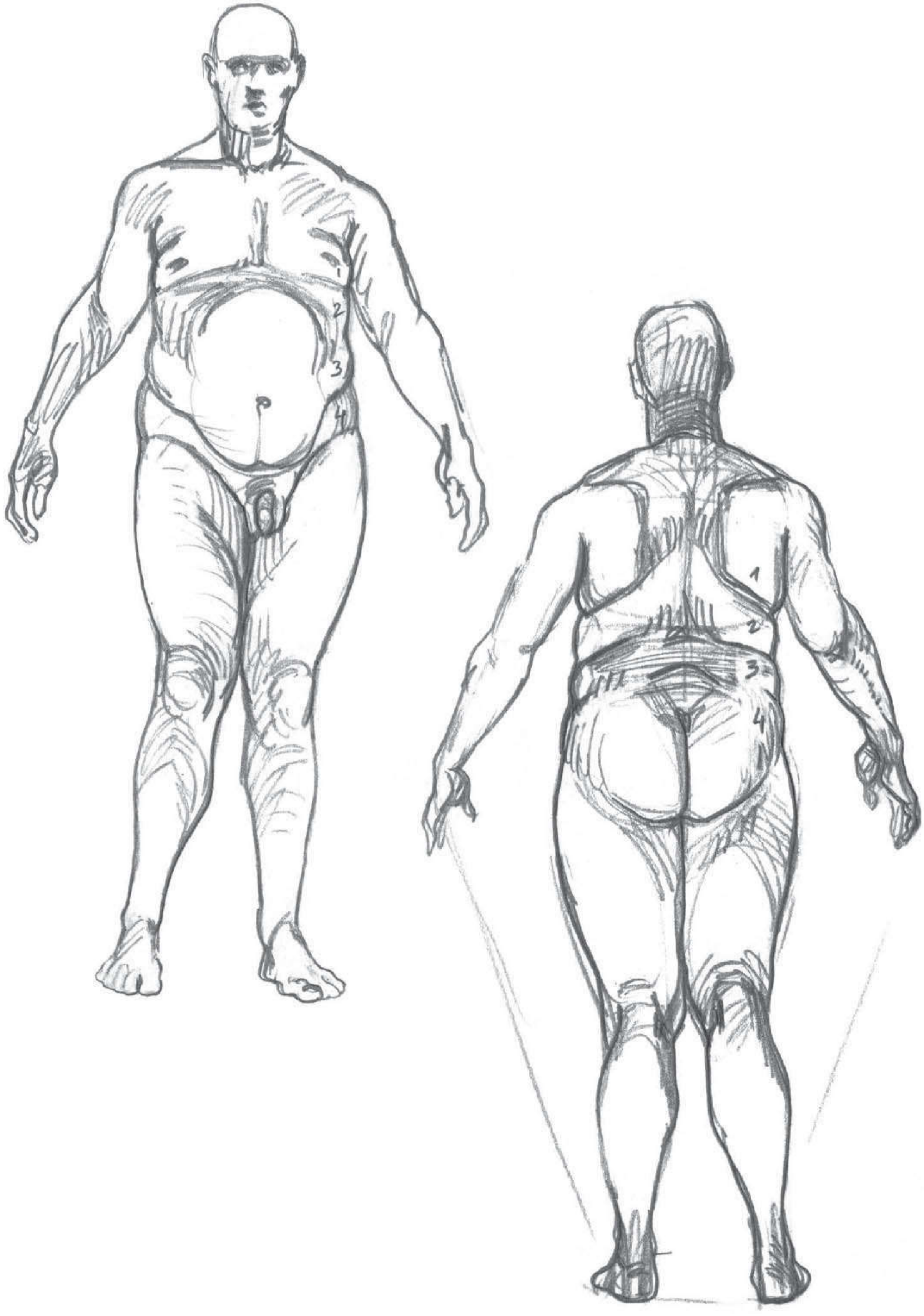


Fig. 2

Fig. 2: *Drawing of a muscular female model. The muscular flanks along the sides are outlined above the wing of the pelvis and become fatty in the back, where it merges with the top of the buttocks*.


1
2
3
4
1
2
3
4

The numbered contours (1, 2, 3, and 4) match up in these two views.

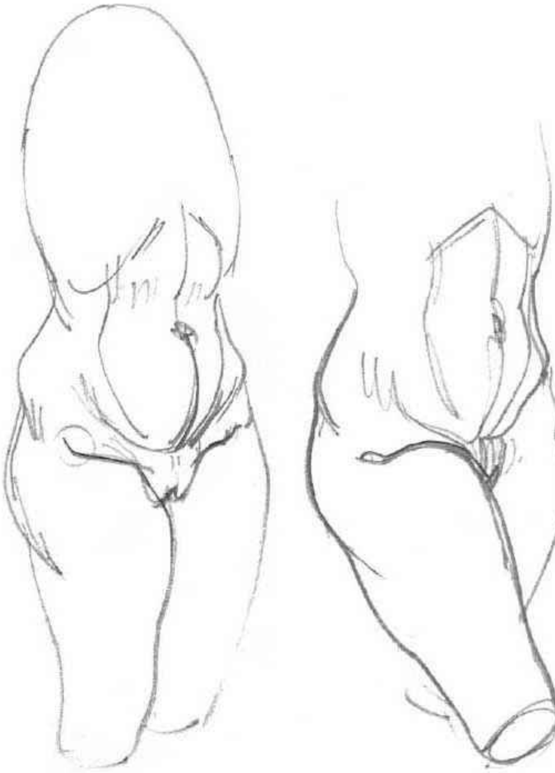


Fig. 1

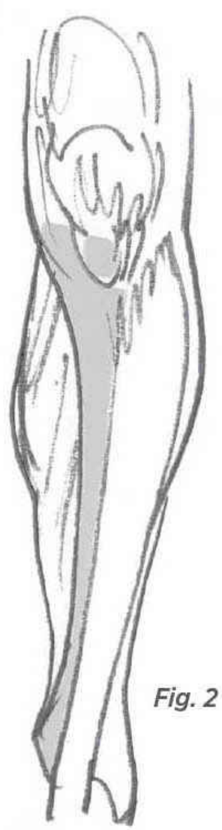


Fig. 2

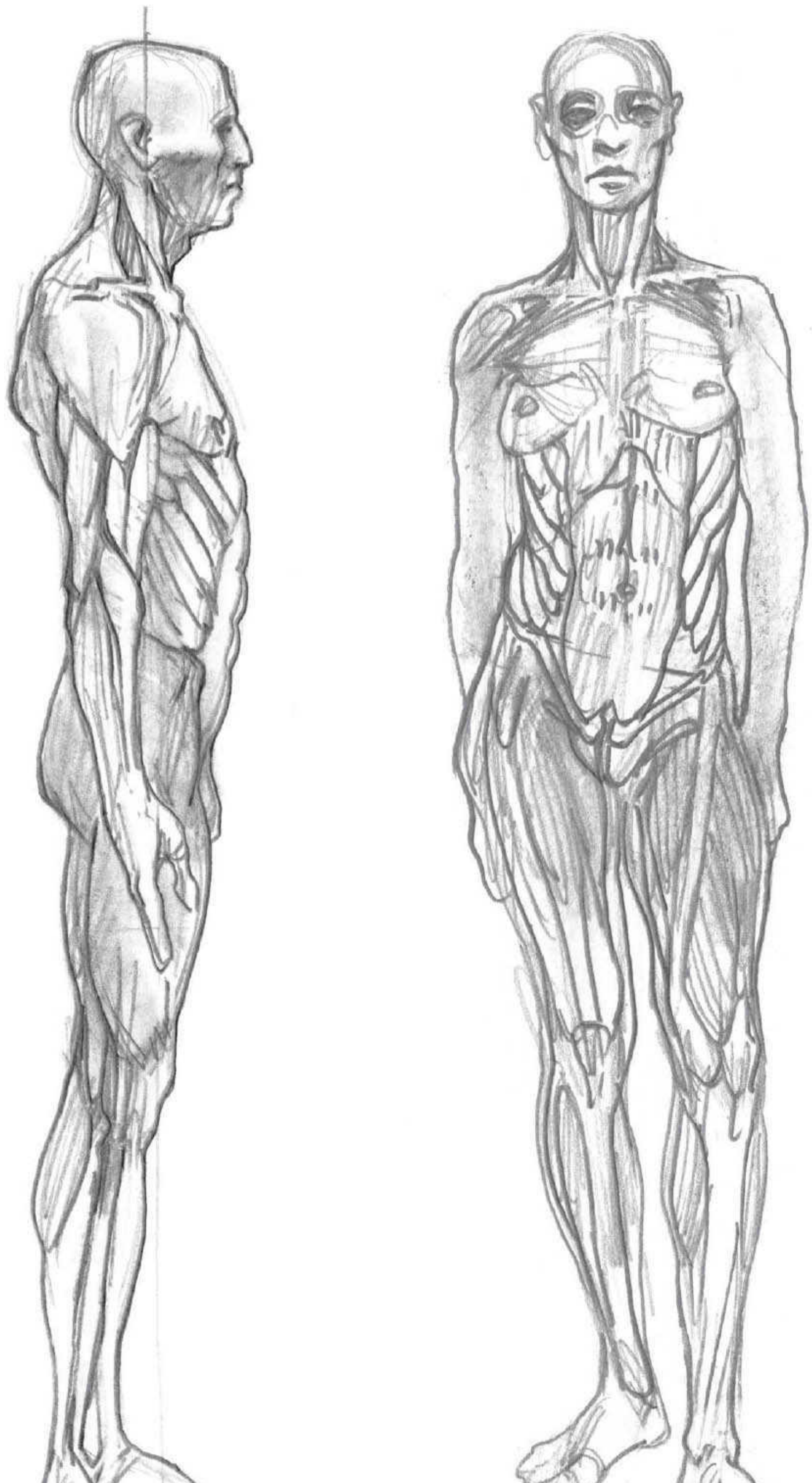
Fig. 1: *Flexion fold*.
Fig. 2: *Subcutaneous tibia*.

Fig. 1

Fig. 1: *In profile, a vertical line falls straight down from the lower jaw joint (inferior maxillary), passes in front of the shoulder, behind the hip joint, in front of the knee joint, and down to the top of the plantar arch. The lumbar vertebrae are in front of the line but then join the sacrum behind it.*

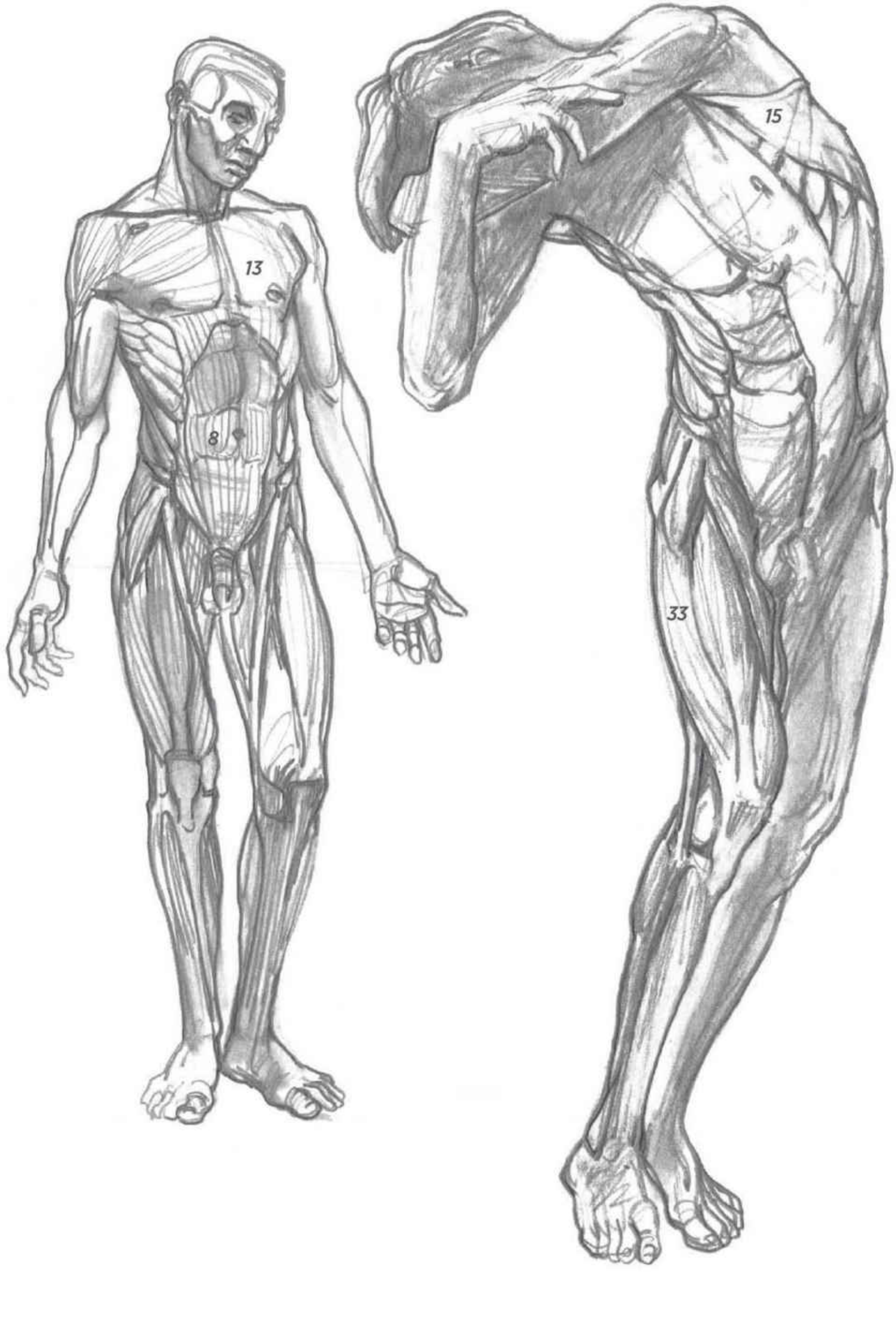
Fig. 2

Fig. 2: *The masses of the various segments alternate from one side to the other of the vertical line.*



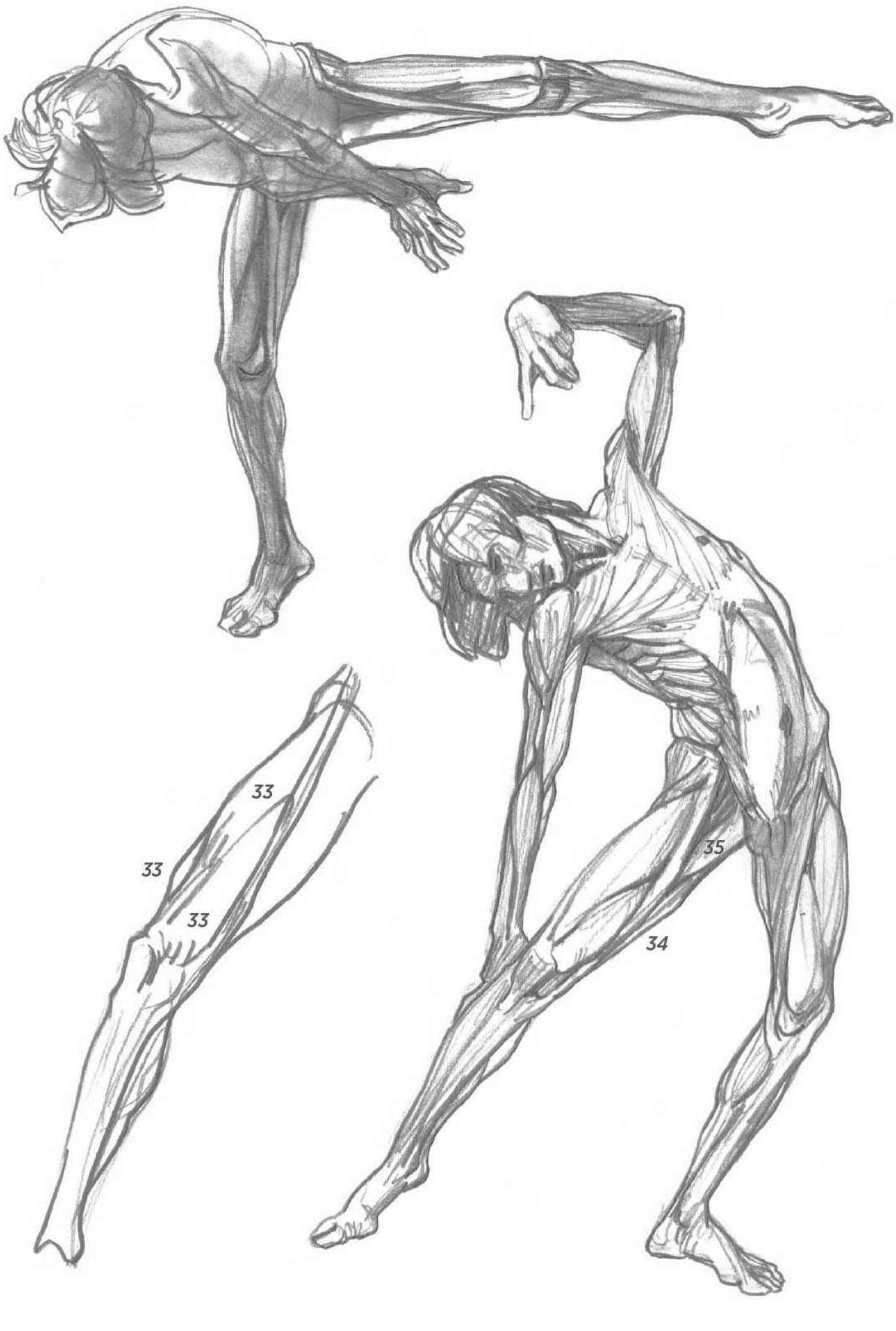
17
16
19
19
31
33

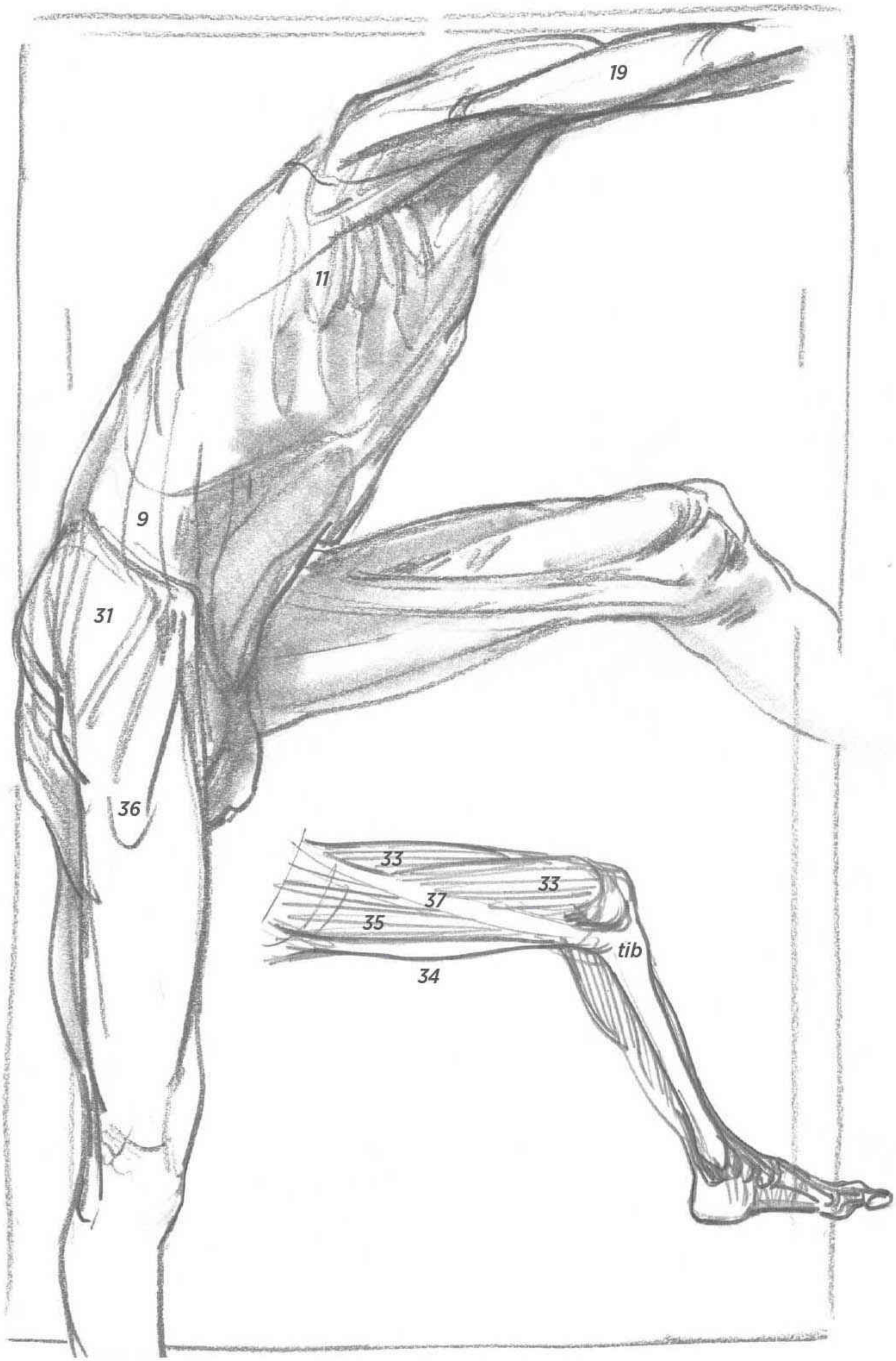

11
15
9

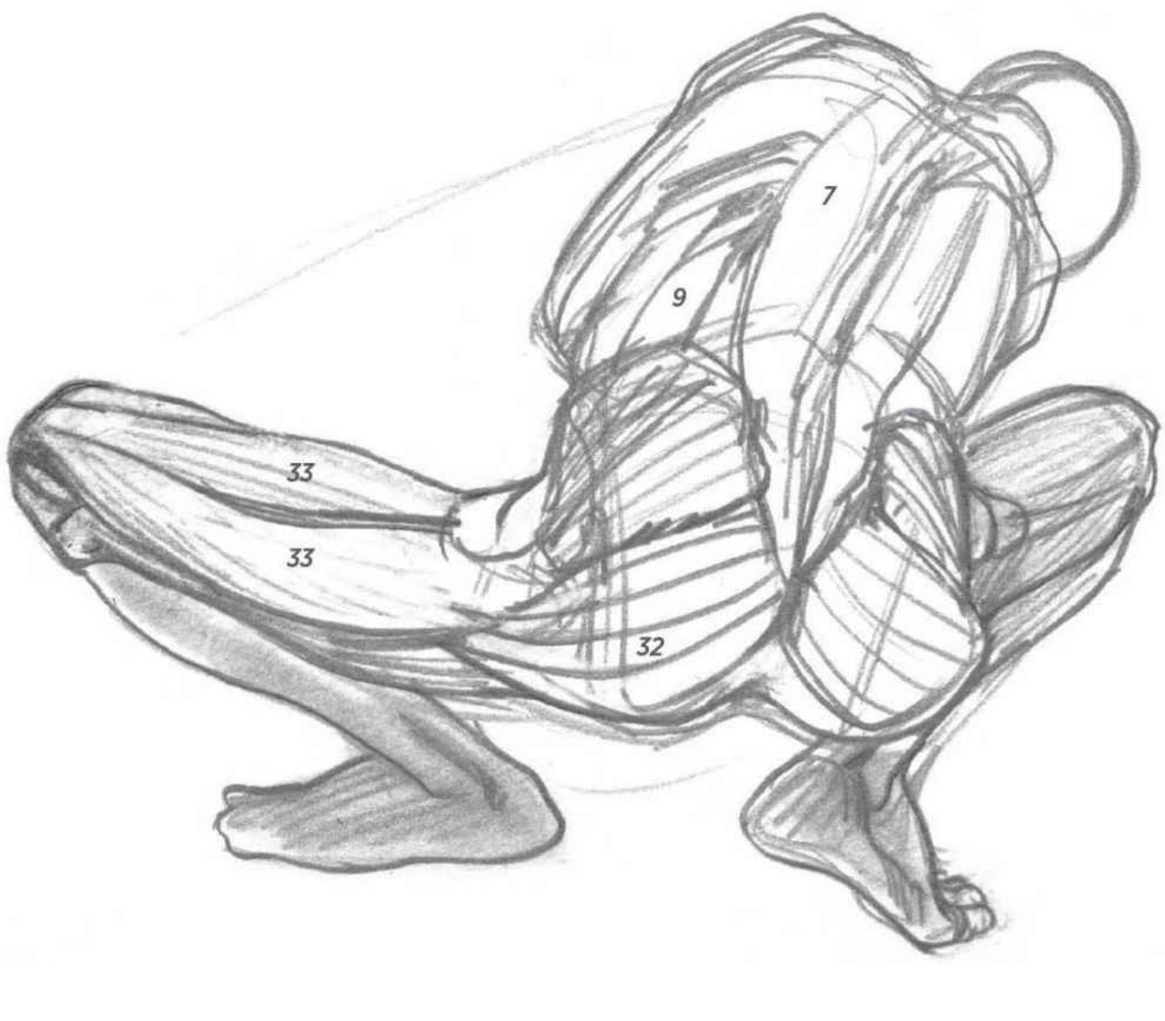

13
8
15
33


17
19
31
36
33


17
19
21
16
14
15
11
21
23
19
22
9
ul
pel

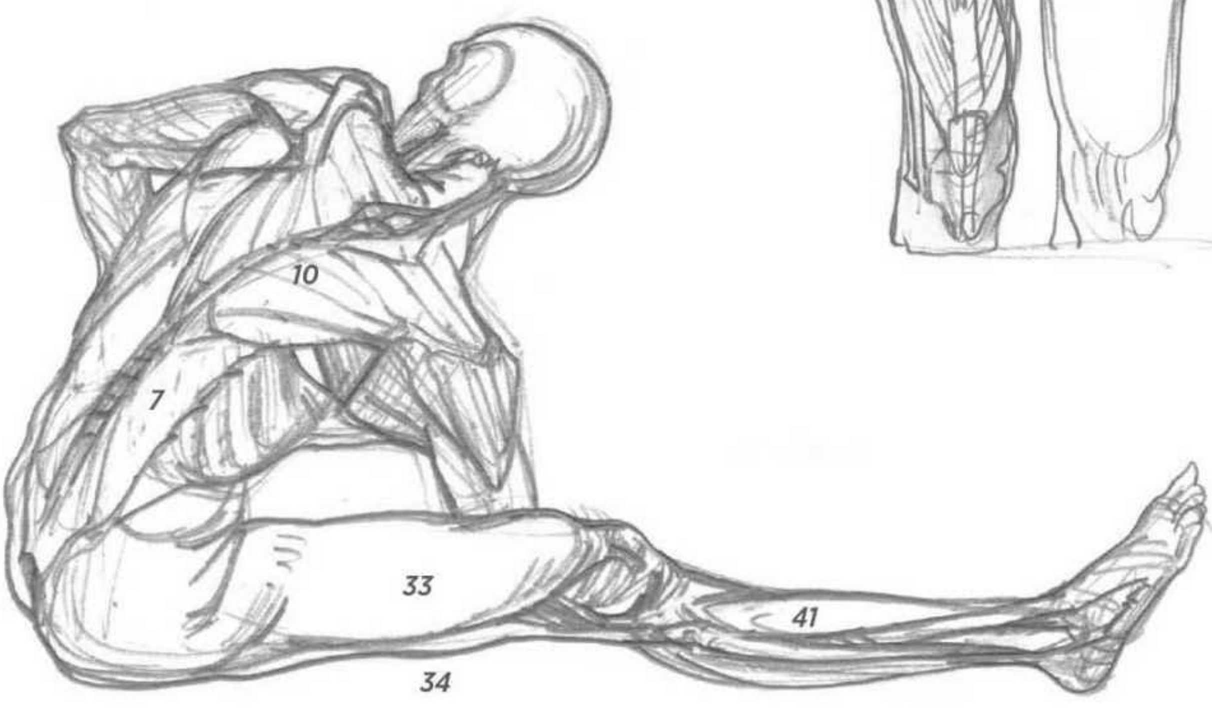

33
33
33
35
34


19
11
9
31
36
33
33
37
35
tib
34


7
9
33
33
32


sc
17
19
16
23
24
15
11
9
33
33
37
34
33
33
33

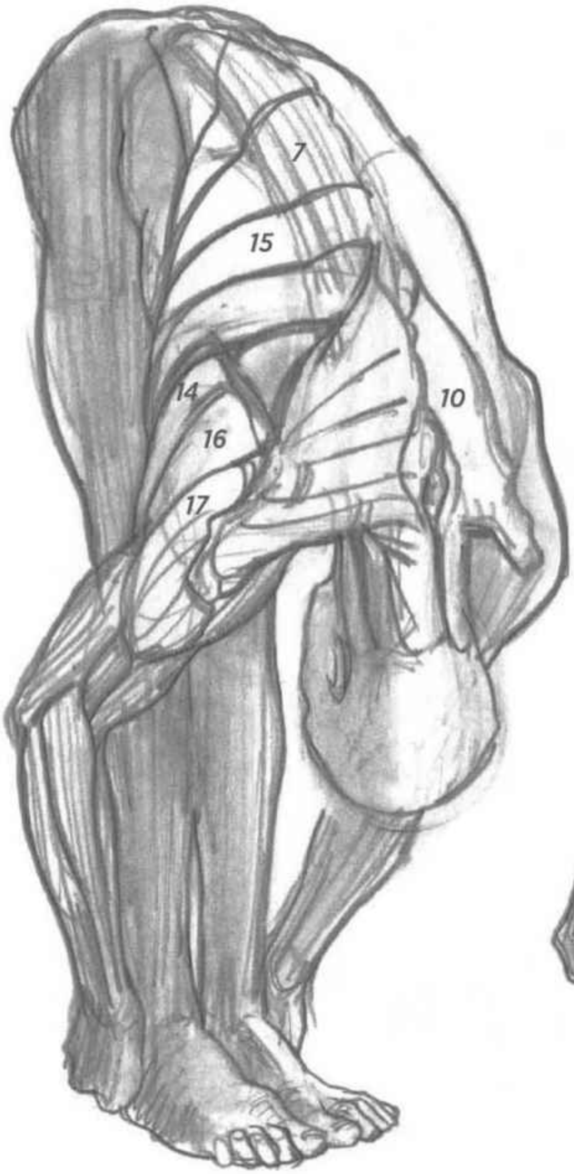
33
33
33
35
33
10
7


10
7
33
41
34


7
9
36
32
33

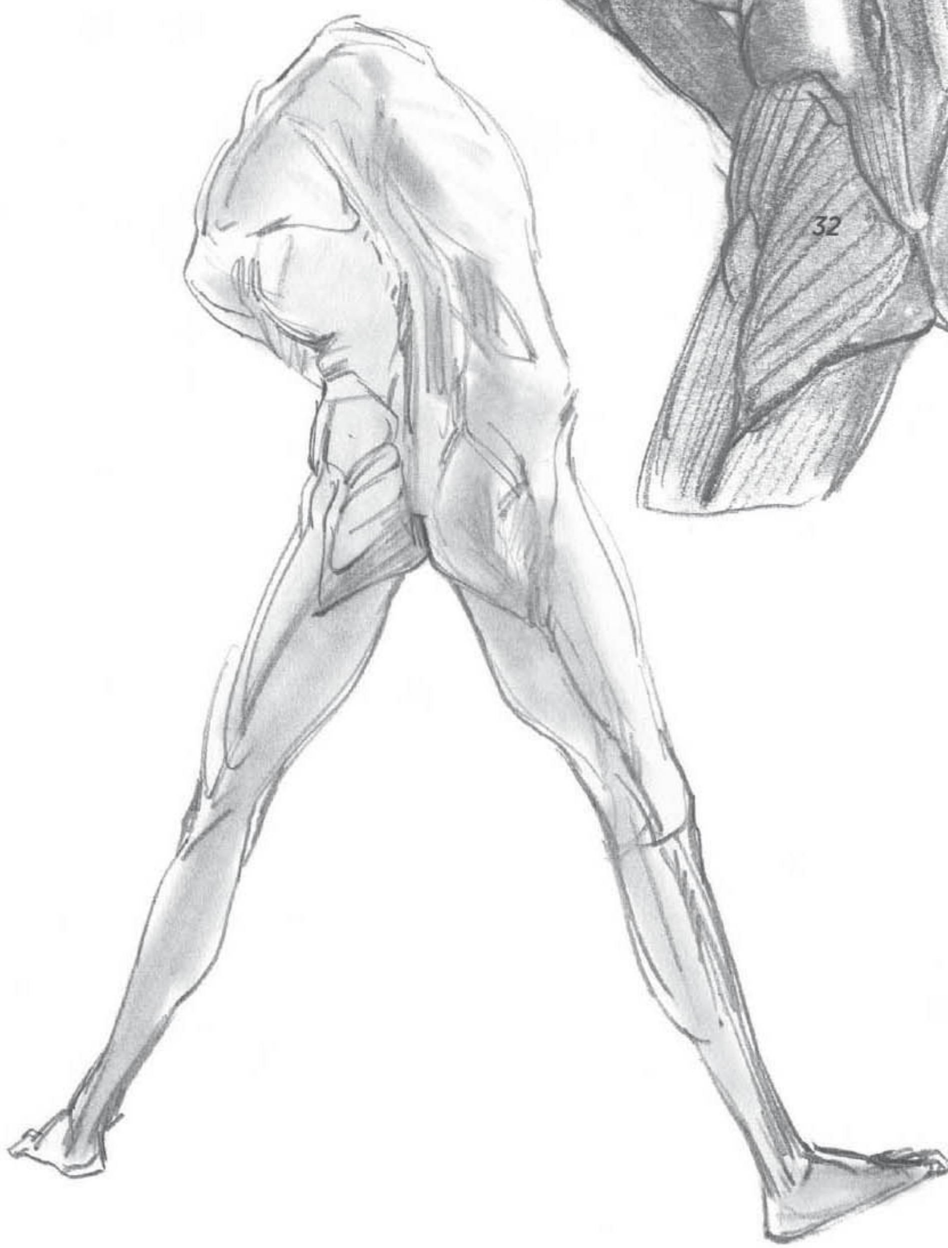

15
11
16
14
17
19
23


16
19
15
7
9
32
36
33

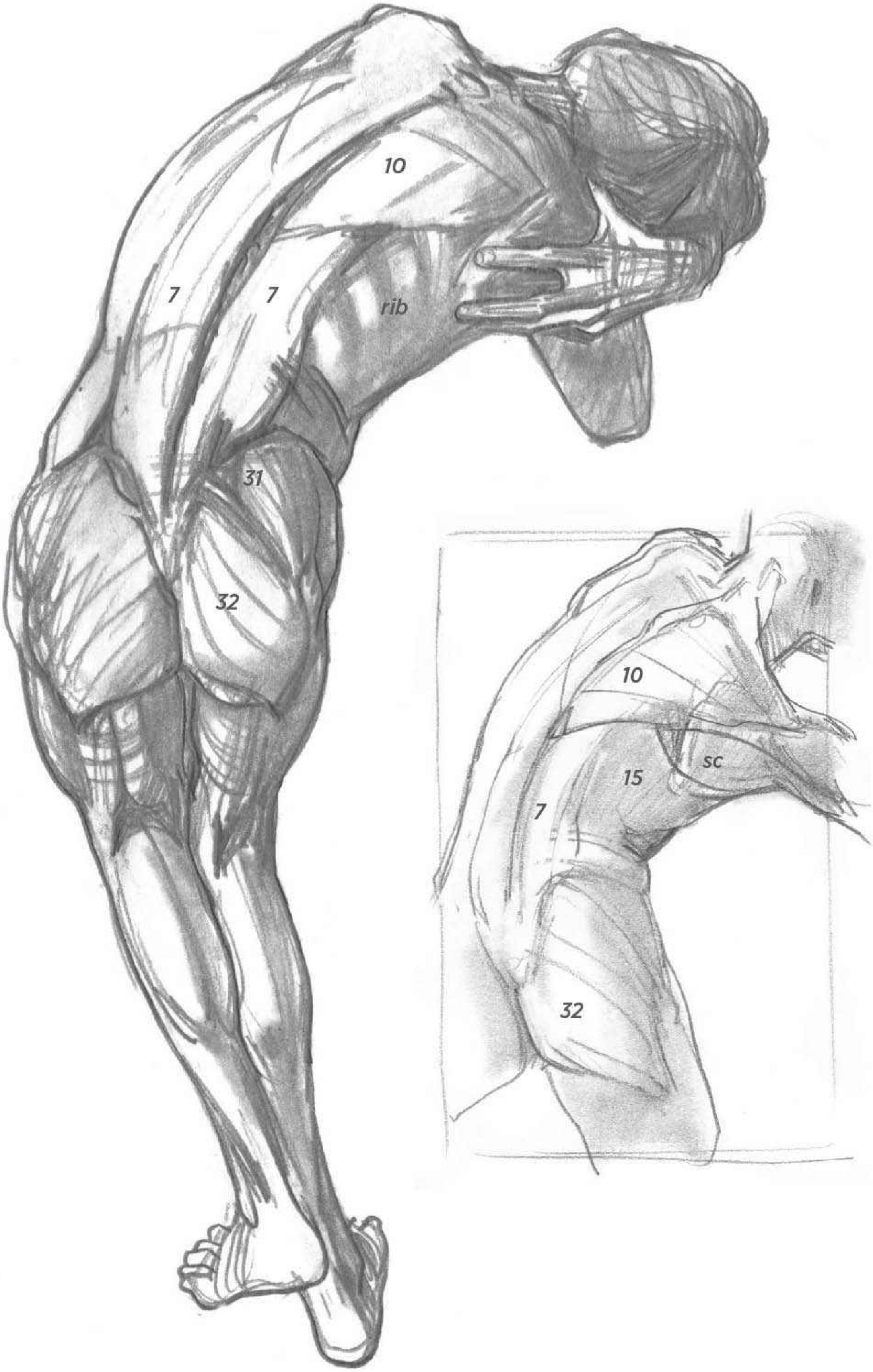

7
15
14
10
16
17


10
15
7


10
rib
sc
15
7
9
31
32



The latissimus dorsi muscle (15) is a veil of muscle that often allows the rib cage to show through.

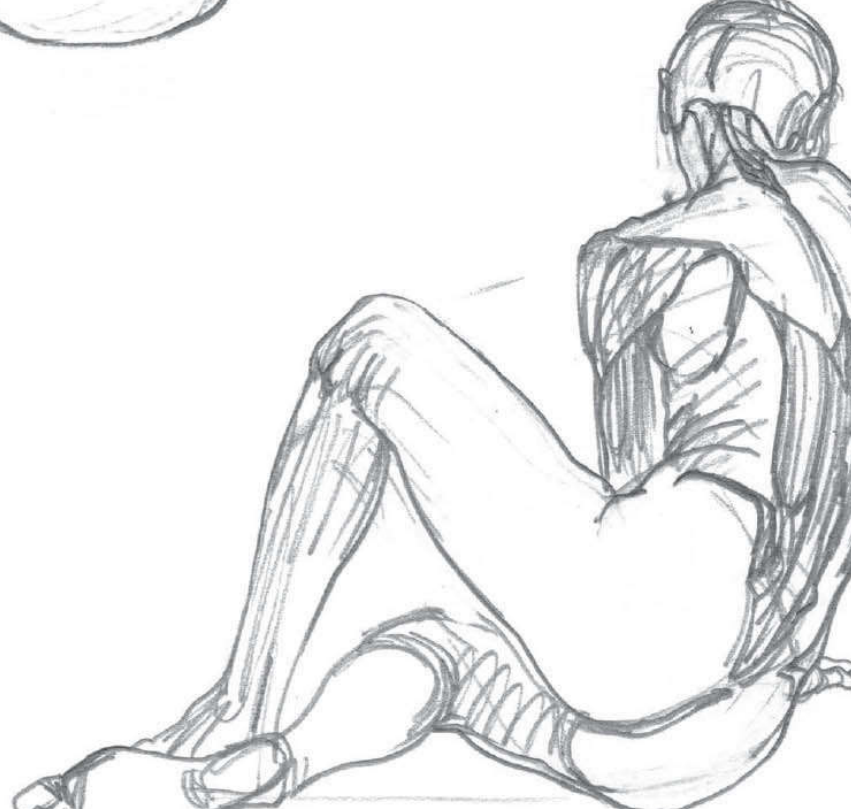

10
7
7
rib
31
32
10
sc
15
7
32


10
32

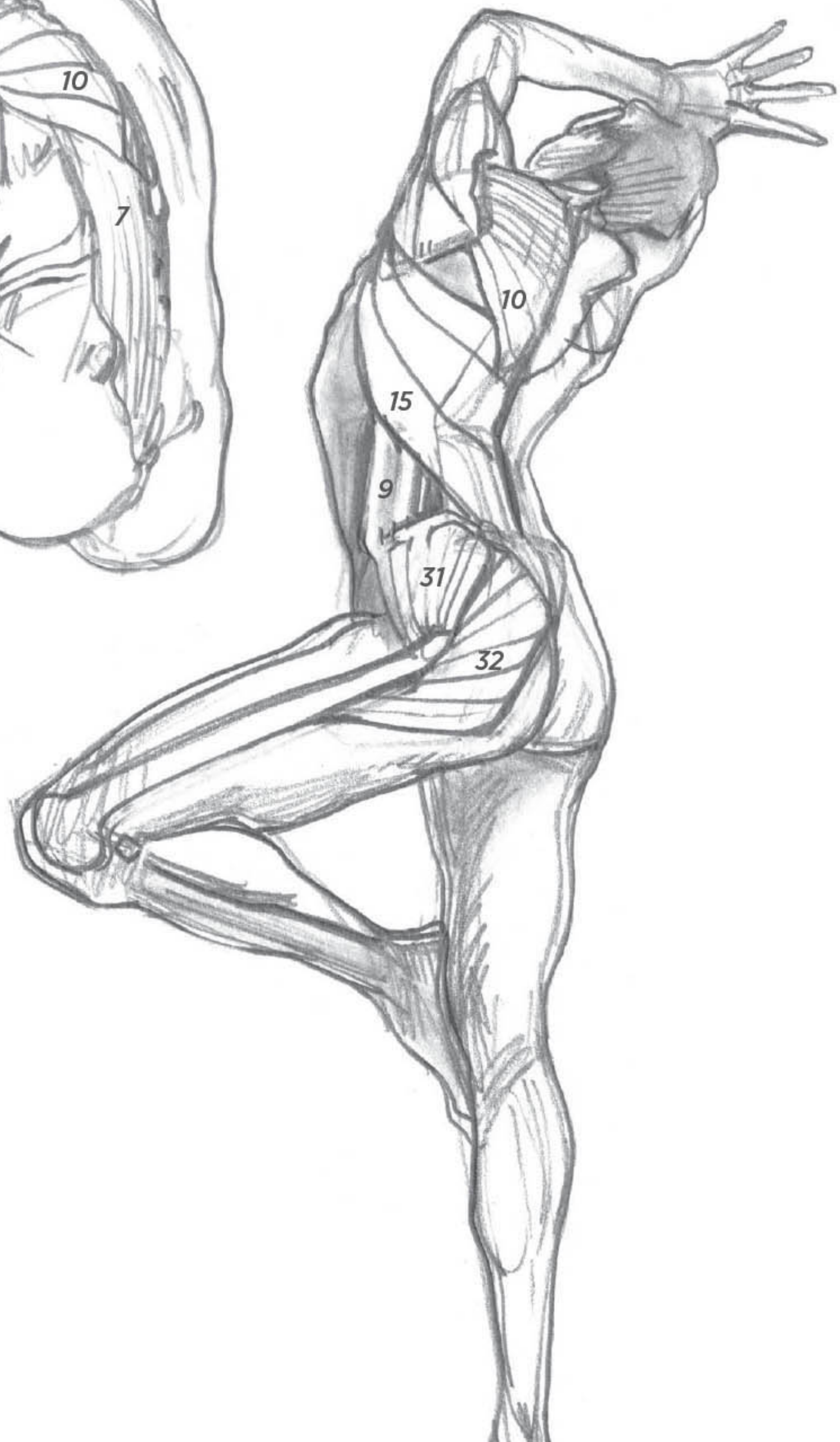

10
7
rib

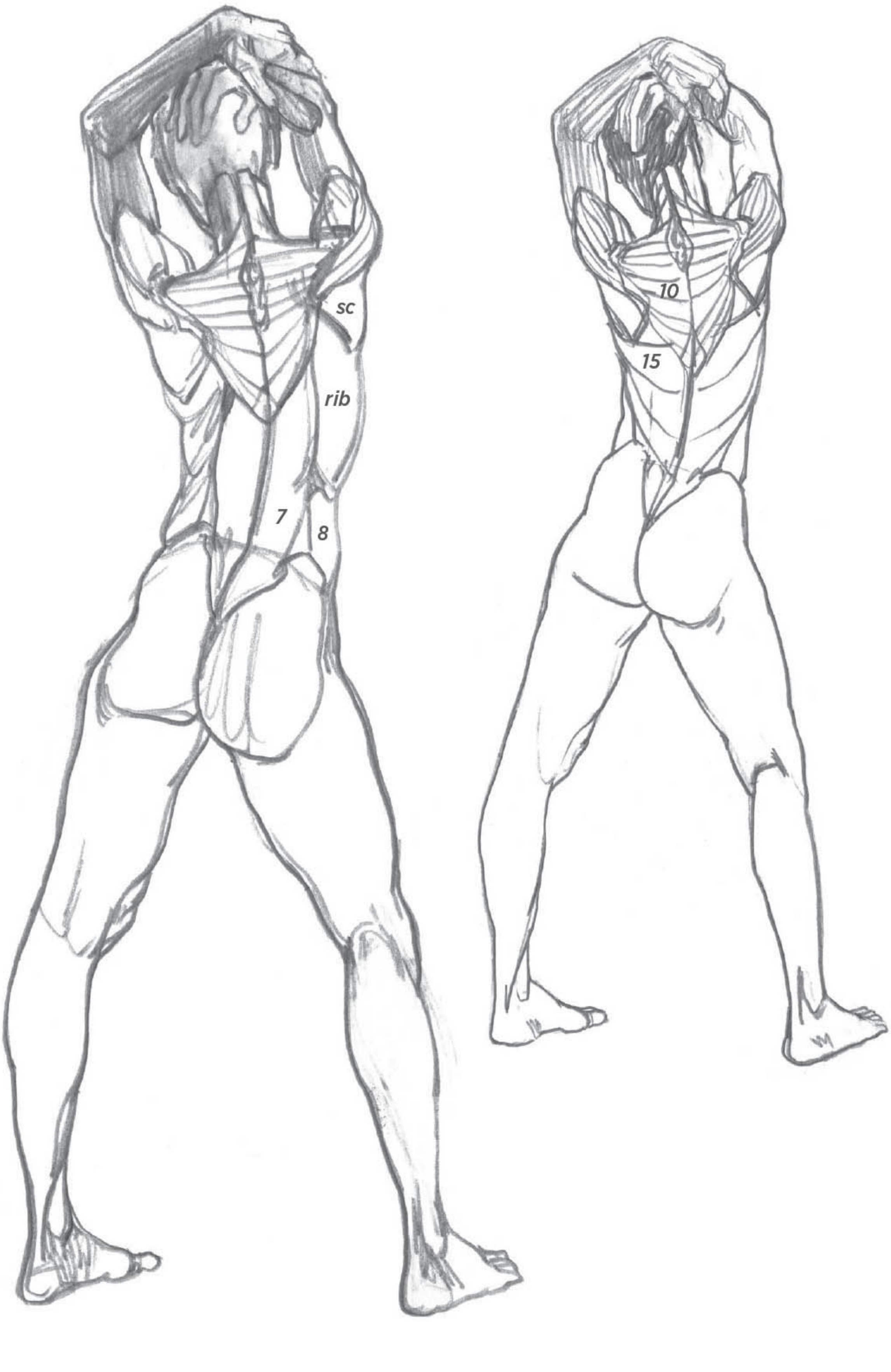

7
32


10
7

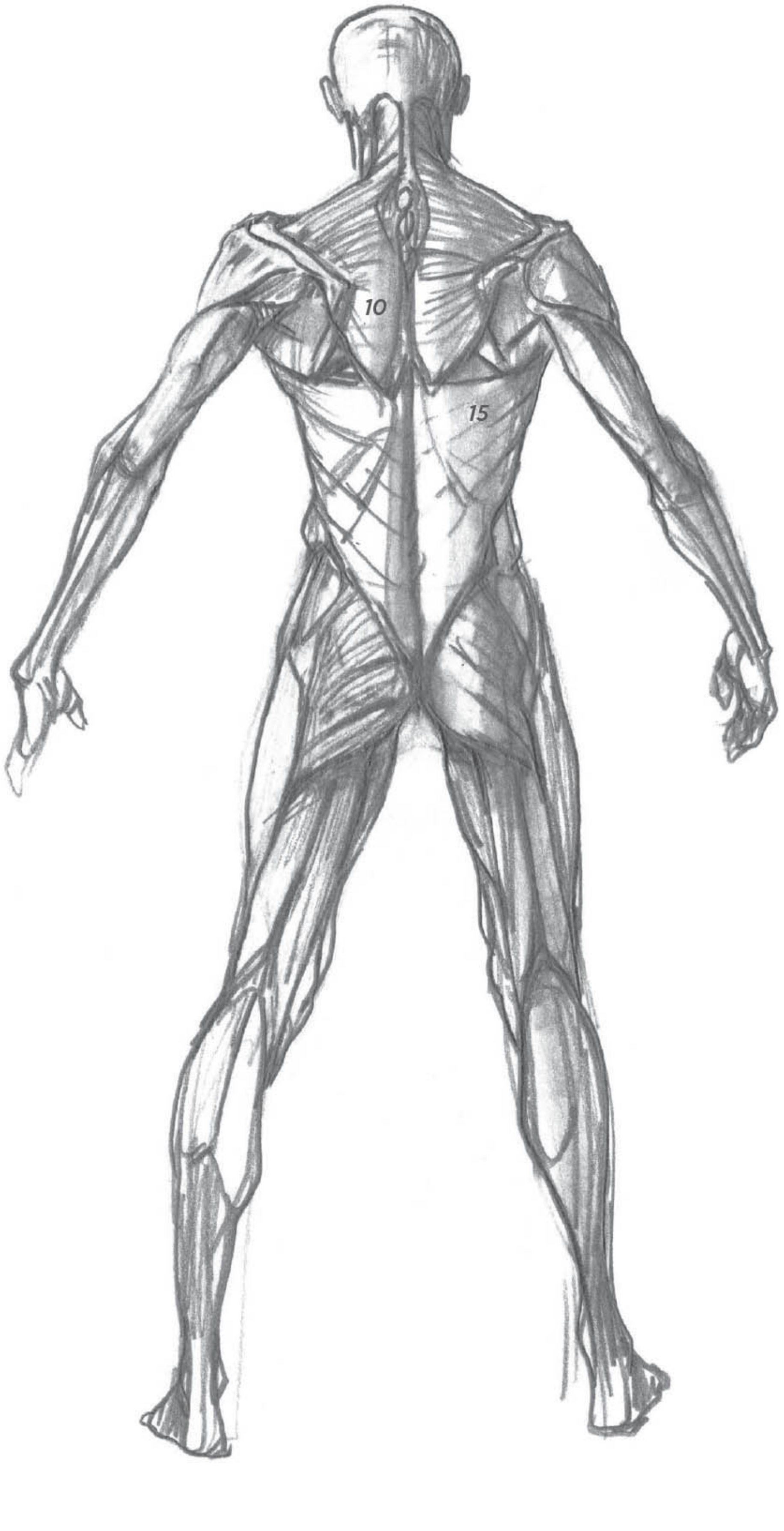


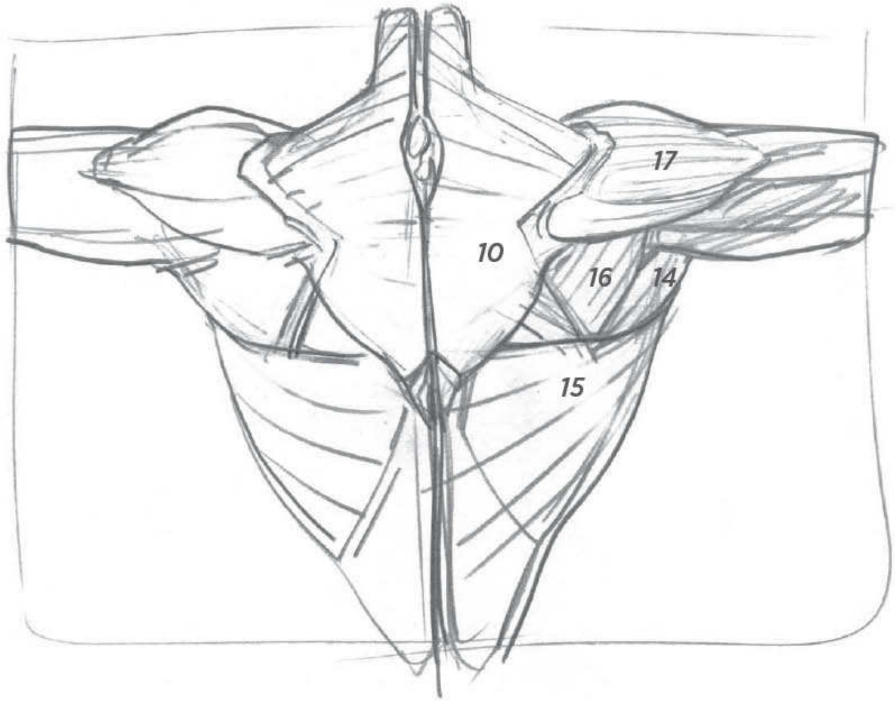

10
7

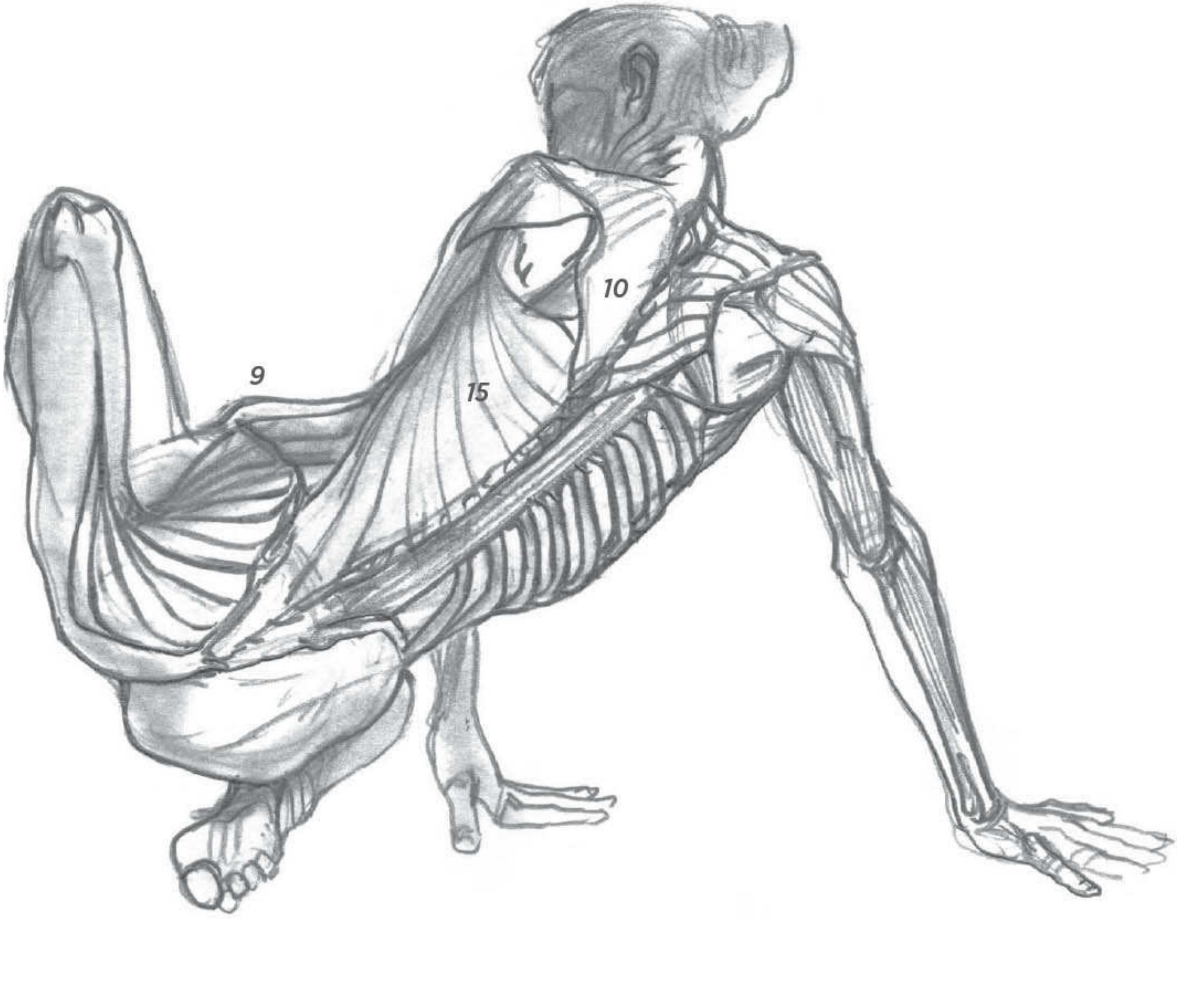

10
15
9
31
32


sc
rib
7
8
10
15

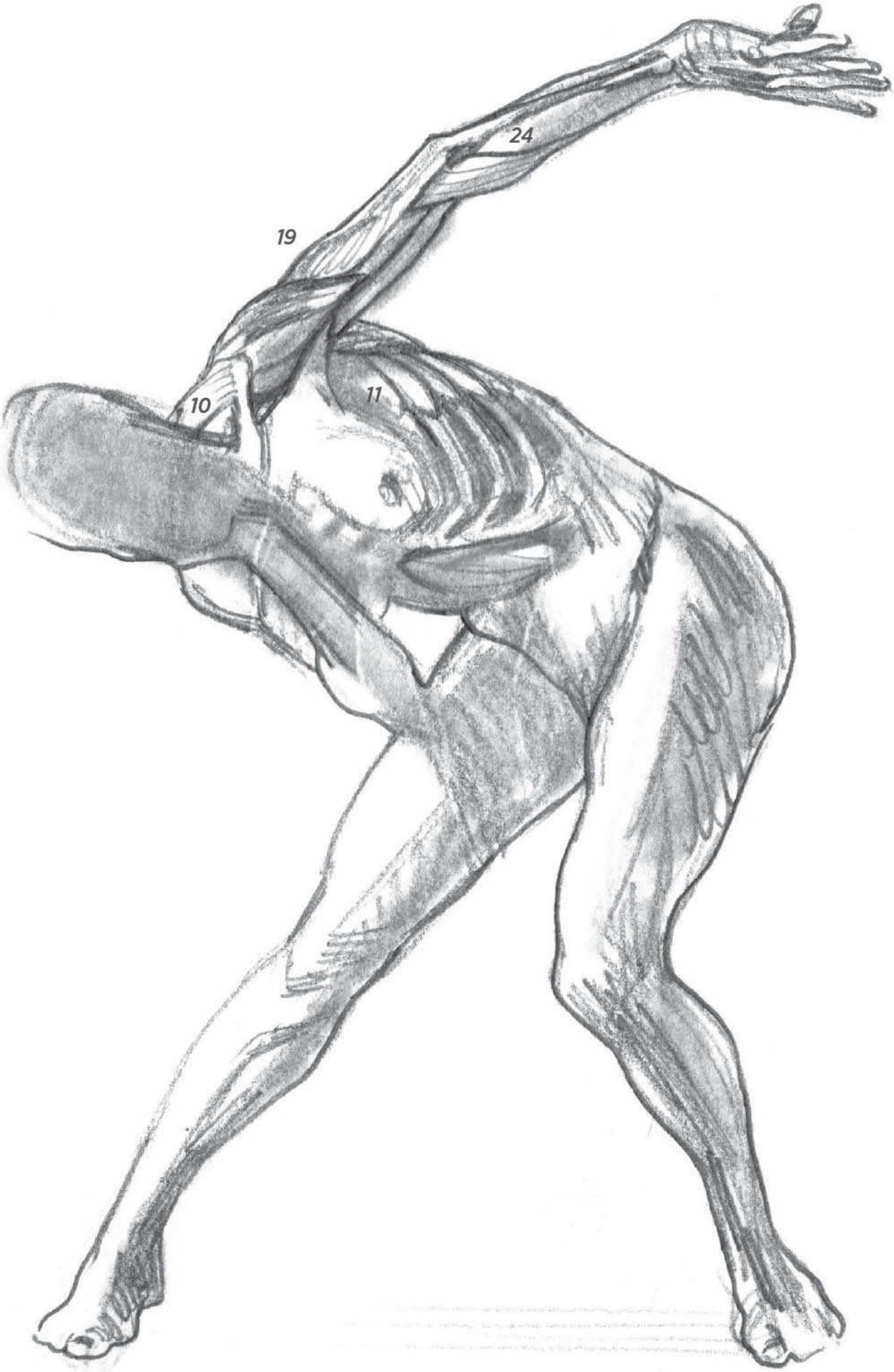

10
16
7
32


10
15

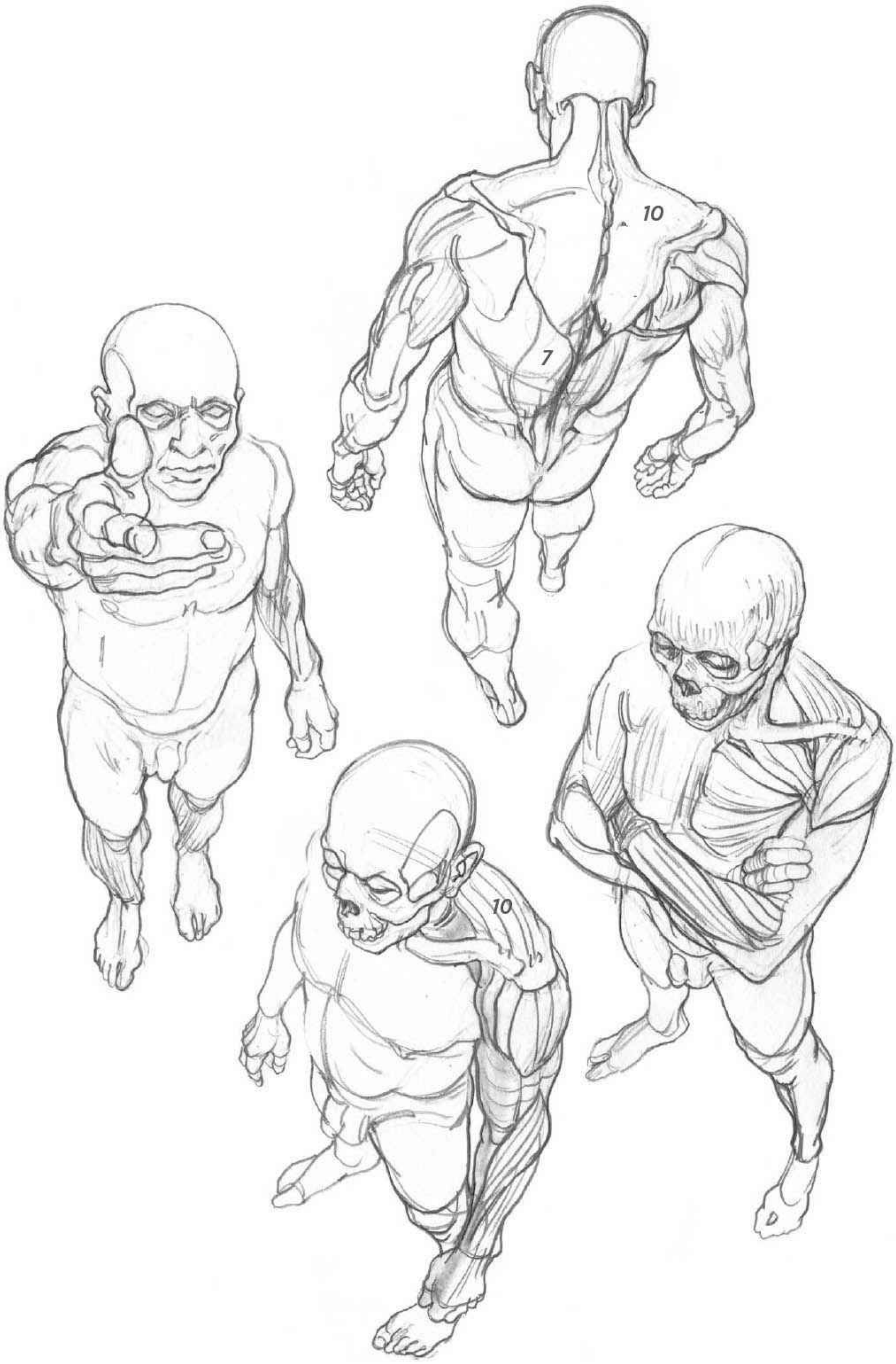

17
10
16
14
15

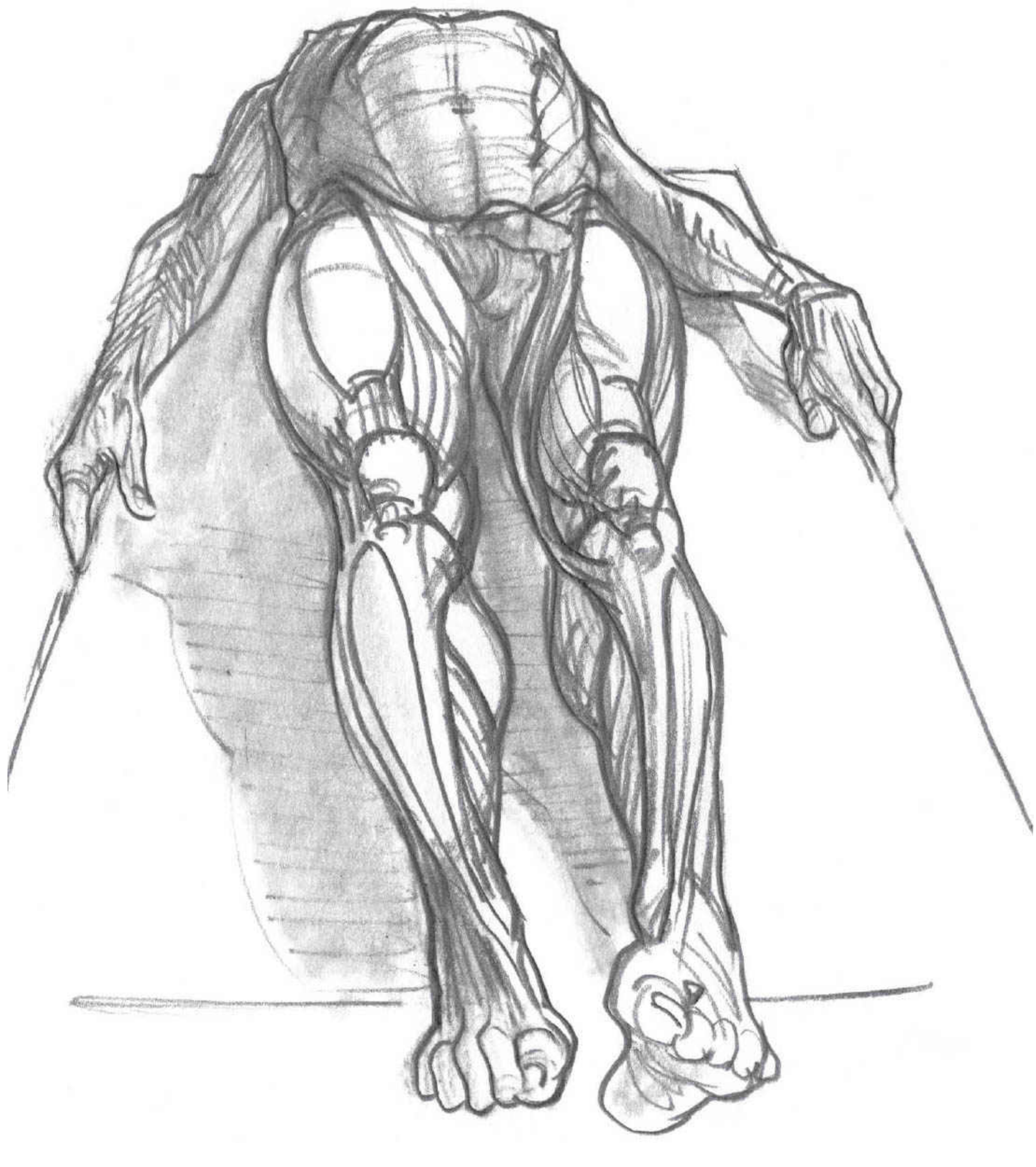

10
9
15

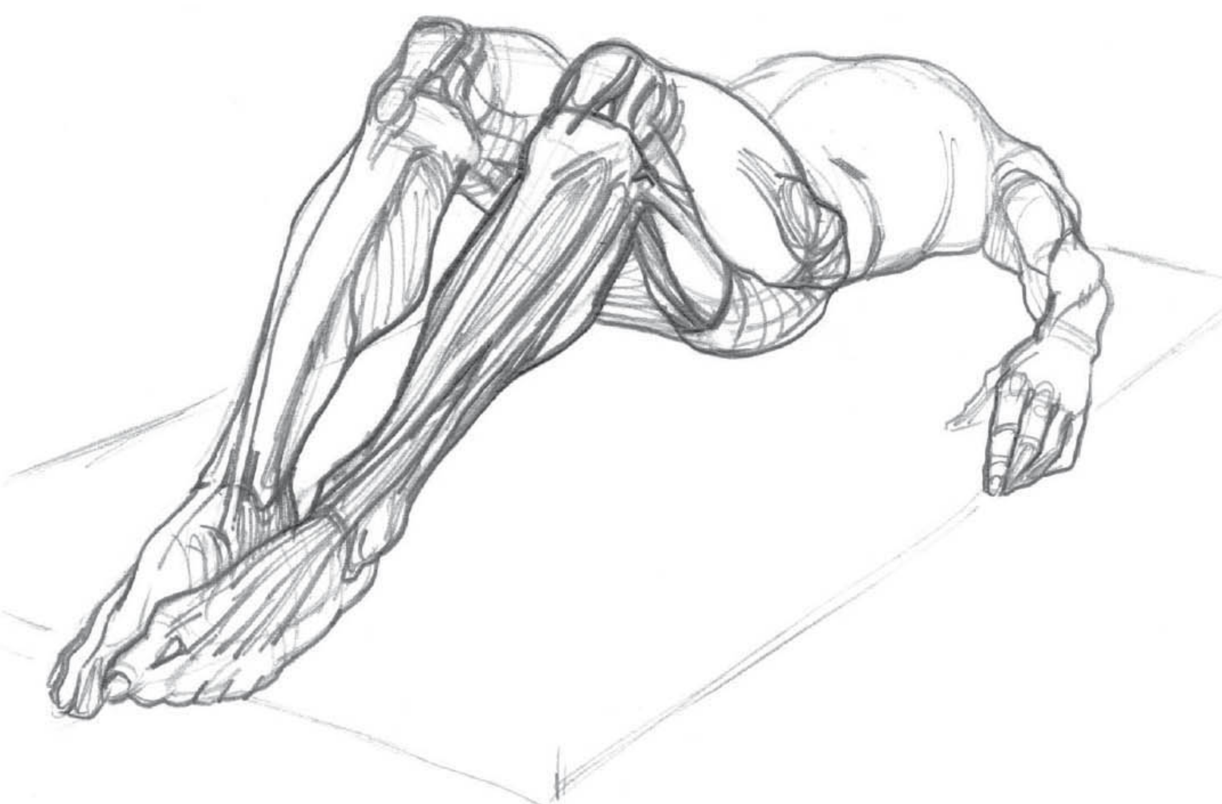
ul
26
21
19

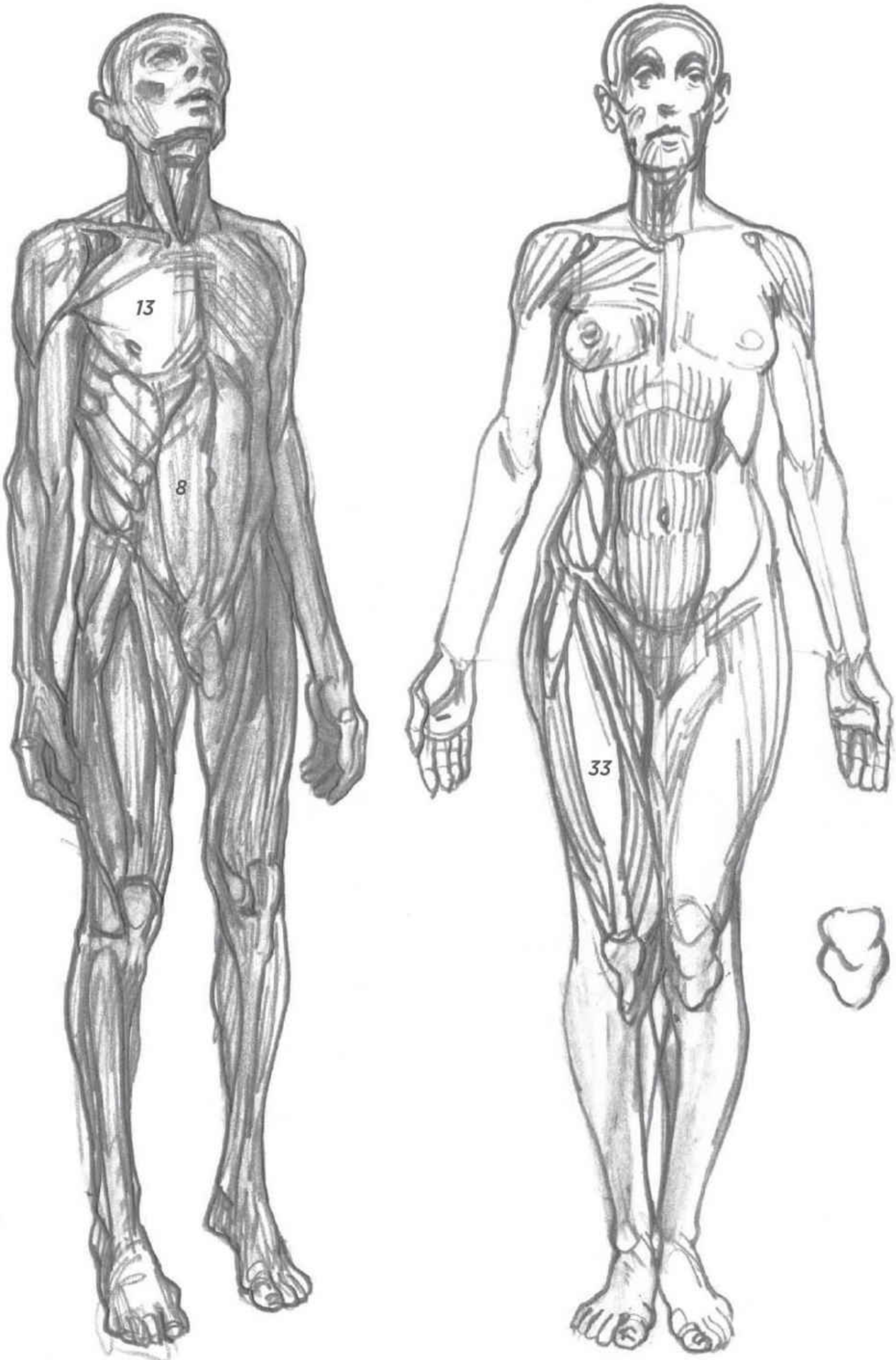


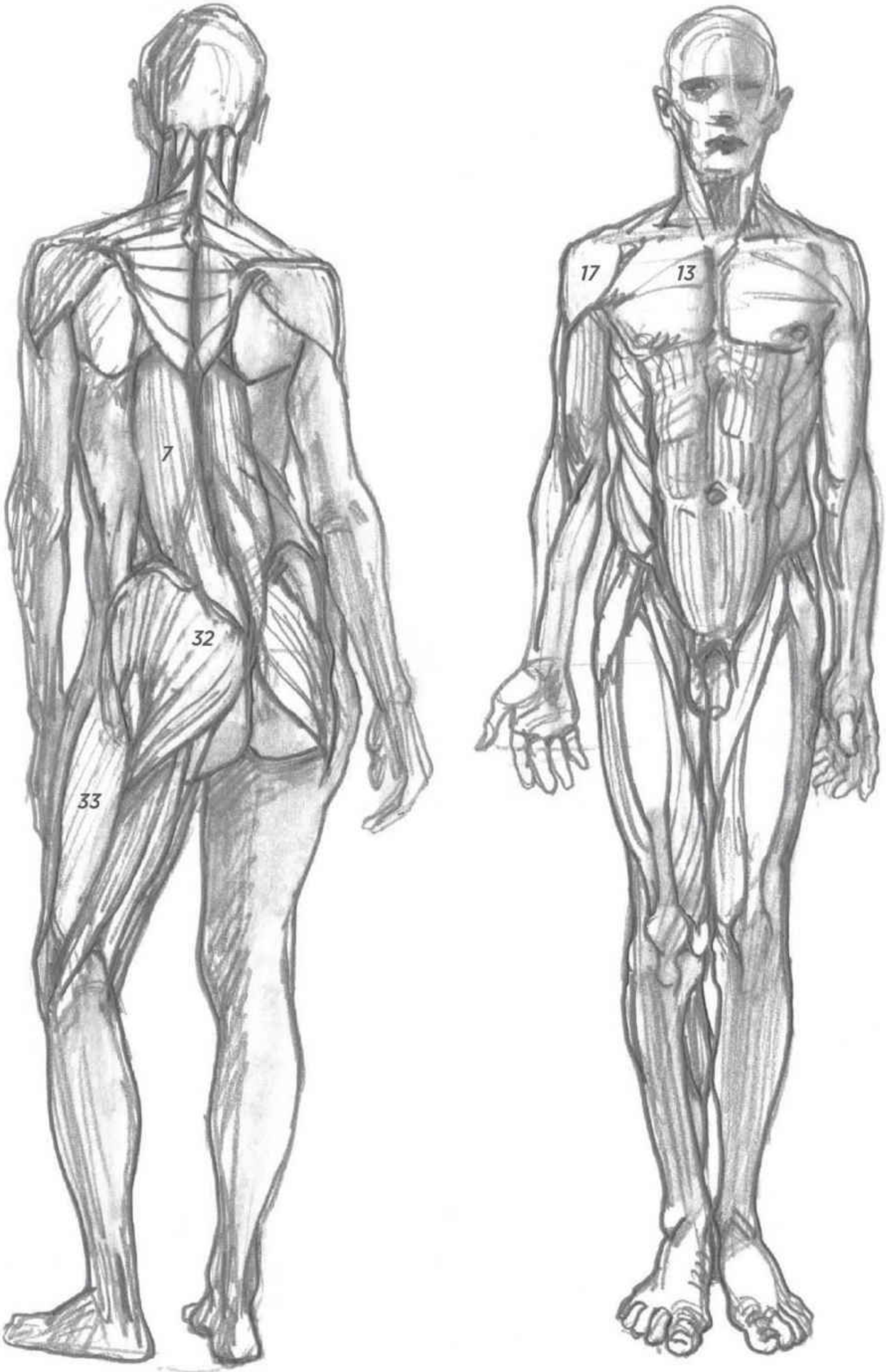
24
19
10
11


10
7
10






13
8
33



7
32
33
17
13

bibliography

Albinus on Anatomy, Robert Beverly Hale and Terence Coyle, Dover Publications, New York, 1988

Artistic Anatomy, Dr. Paul Richer and Robert Beverly Hale, Watson-Guptill, New York, 1986

Atlas of Human Anatomy and Surgery, J. M. Bourgery and N. H. Jacob, Jean-Marie Le Minor and Henri Sick, Taschen, Cologne, 2005

Atlas of Human Anatomy for the Artist, Stephen Rogers Peck, Oxford University Press, New York, 1979

Constructive Anatomy, George B. Bridgman, Dover Publications, New York, 1973

New Artistic Anatomy: Female Morphology, Dr. Paul Richer, Benham Books, 2015

The Human Machine, George B. Bridgman, Dover Publications, New York, 1972

French publications from the original French edition:

Anatomie artistique du corps humain, Édouard Cuyer and

Antoine-Louis-Julien Fau, Librairie J.-B. Baillière and sons, Paris, 1890

Anatomie humaine, H. Rouvière and A. Delmas, Masson, Paris, 1984

Anatomie topographique, descriptive et fonctionnelle, Alain Bouchet and Jacques Cuilleret, Simep, Paris, 1983

André Vésale, iconographie anatomique, Pierre Huard and Marie-José Imbault-Huart, Éditions Roger Dacosta, Paris, 1980

Artistes et mortels, Michel Lemire, Chabaud, Paris, 1990

Au coeur du fantastique, Roger Caillois, Gallimard, Paris, 1965

Canon des proportions du corps humain, Paul Richer, Delagrave, Paris, 1893

Dessins et traités d'anatomie, Jacques-Louis Binet and Pierre Descargues, Éditions du Chêne, Paris, 1980

Figures du corps, sous la direction de Philippe Comar, Beaux-Arts de Paris, 2008

Histoire de l'anatomie plastique, Mathias Duval and Édouard Cuyer, Alcide Picard and Kaan, Paris, 1898

L'Anatomie artistique, Mathias Duval, Maison Quantin, Paris, 1881

Le cere anatomiche della Specola di Firenze, Benedetto Lanza, Maria Luisa Azzaroli Puccetti, Marta Poggesi, and Antonio Martelli, Arnaud, Florence, 1997

Nouvelle anatomie artistique, volume I: Éléments d'anatomie, l'homme, Paul Richer, Librairie Plon, Paris, 1906

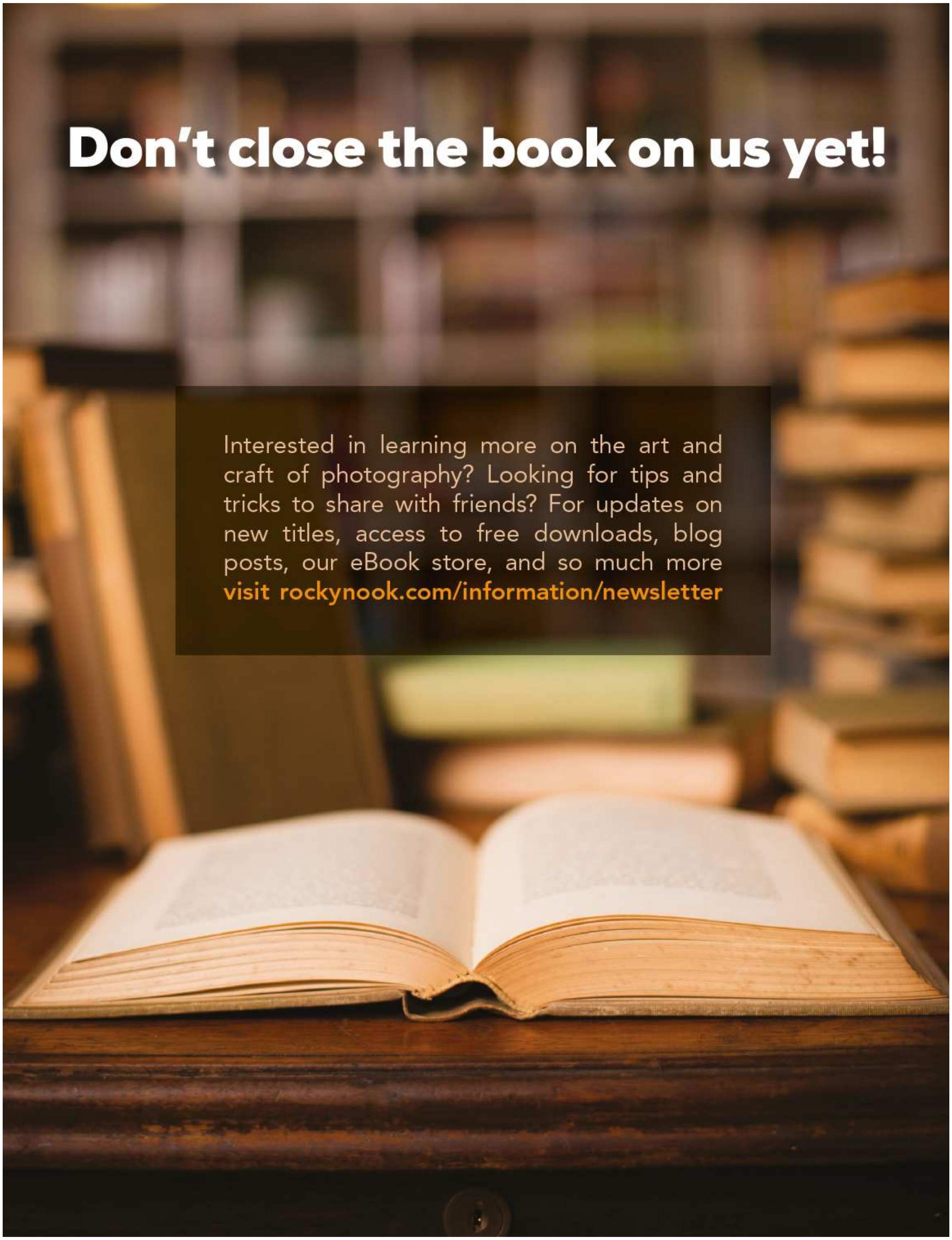
Nouvelle anatomie artistique, volume III: Physiologie, attitudes et mouvements, Paul Richer, Librairie Plon, Paris, 1921

skeleton

Abbreviations	Common names	Location	
sk	Skull Jaw		Head
hy *thy*	Hyoid bone Thyroid cartilage		Neck
rib *ster* *col* *pel* *sacr*	Rib cage Sternum Spinal column Pelvis Sacrum		Torso
cl *sc*	Clavicle Scapula	Shoulder girdle	Upper limb
hum	Humerus	Arm	
rad *ul*	Radius Ulna	Forearm	
carp *meta* *phal*	Carpals Metacarpals Phalanges	Hand	
fe *pa*	Femur Patella	Thigh	Lower limb
tib *fib*	Tibia Figula	Leg	
tar *meta* *phal*	Tarslas Metatarsals Phalanges	Foot	

musculature

Principal functions	Principal insertion points	Muscles	
Closing the eye	Socket frame, eyelids	*Orbicularis oculi*	*1*
Closing the mouth	Lips	*Orbicularis oris*	*2*
Opening the mouth	Skull, lips	*Mouth muscles*	*3*
Closing the jaw (chewing)	Skull (temporal cavity, lower jaw)	*Temporal*	*4*
Closing the jaw	Skull (cheekbone, lower jaw)	*Masseter*	*5*
Tilting and rotating the head	Sternum, clavicle, skull	*Sternocleidomastoid*	*6*
Extending the torso and the head	Pelvis, spine, rib cage, skull	*Spinal muscles*	*7*
Flexing the torso	Pelvis, rib cage	*Rectus abdominis*	*8*
Bending and rotating the torso	Pelvis, rib cage	*Obliques*	*9*
Tilting the scapula, helping to lift the arm	Spine, scapula, skull	*Trapezius*	*10*
Tilting the scapula, helping to lift the arm	Scapula, rib cage	*Serratus anterior*	*11*
Rotating the scapula	Scapula, spine	*Rhomboid*	*12*
Lowering and adducting the arm	Rib cage, clavicle, humerus	*Pectoral*	*13*
Lowering and rotating the arm	Scapula, humerus	*Teres major*	*14*
Lowering and rotating the arm	Pelvis, spine, humerus	*Latissimus dorsi*	*15*
Rotating the arm	Scapula, humerus	*Infraspinatus*	*16*
Rotating the arm	Scapula, clavicle, humerus	*Deltoid*	*17*
Suspending the arm	Scapula, humerus	*Coracobrachialis*	*18*
Extending the forearm	Scapula, humerus, ulna	*Triceps*	*19*
Extending the forearm	Humerus, ulna	*Anconeus*	*20*
Flexing the forearm	Scapula, radius	*Biceps*	*21*
Flexing the forearm	Humerus, ulna	*Brachialis*	*22*
Flexing the forearm	Humerus, radius	*Brachioradialis*	*23*
Extending the hand and fingers	Humerus, carpals, metacarpals, phalanges	*Extensors: carpi ulnaris, digitorum communis, 1st and 2nd radials*	*24*
Extending the thumb	Ulna, radius, first metacarpal, phalanges	*Thumb extensors*	*25*
Flexing the hand and fingers	Humerus, carpals, metacarpals, phalanges	*Flexors: carpi ulnaris, digitorum communis, palmaris longus*	*26*
Rotating the forearm	Humerus, radius	*Pronator teres*	*27*
Closing the angle between thumb and index finger	First and second metacarpals, phalange of the index finger	*Interosseous*	*28*
Flexing the thumb	Carpal, metacarpal, first phalange of the thumb	*Thumb flexors*	*29*
Flexing the little finger	Carpal, metacarpal, first phalange of the little finger	*Little finger flexors*	*30*
Abducting the thigh	Pelvis, femur	*Gluteus medius*	*31*
Extending the thigh	Pelvis, femur	*Gluteus maximus*	*32*
Flexing the thigh, extending the leg	Pelvis, femur, patella, tibia	*Quadriceps*	*33*
Flexing the leg	Pelvis, femur, tibia, fibula	*Hamstrings*	*34*
Adducting the thigh	Pelvis, femur, tibia, fibula	*Gracilis and adductors*	*35*
Flexing the thigh	Pelvis, tibia	*Tensor muscle of the fascia lata*	*36*
Flexing and rotating the thigh and the leg	Pelvis, tibia	*Sartorius*	*37*
Extending the foot	Tibia, fibula	*Soleus*	*38*
Extending the foot	Femur, heel	*Inferior gemellus (gastrocnemius)*	*39*
Extending the foot	Femur, heel	*Superior gemellus (gastrocnemius)*	*40*
Flexing the foot	Tibia, first metatarsal	*Anterior tibialis*	*41*
Extending the toes	Tibia, fibula, phalanges	*Extensors (on foot)*	*42*
Extending the foot	Fibula, first and last metatarsals	*Peroneal*	*43*
Tensing the plantar arch	Heel, first phalange of the big toe	*Abductor muscle of the hallux*	*44*



Don't close the book on us yet!
Interested in learning more on the art and craft of photography? Looking for tips and tricks to share with friends? For updates on new titles, access to free downloads, blog posts, our eBook store, and so much more visit rockynook.com/information/newsletter

rockynook